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## USAAVLABS TECHNICAL REPORT 66-6

### ENGINEERING LABORATORY REPORT OV-1A MOHAWK FLIGHT LOADS INVESTIGATION PROGRAM

By

David Chestnutt

January 1966

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**ENGINEERING LABORATORY REPORT**

**Project 1P125901A14229, House Task 65-15  
USAAVLABS Technical Report 66-6  
January 1966**

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INVESTIGATION PROGRAM**

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## SUMMARY

A primary objective of this effort was to provide operational data for establishing future short takeoff and landing (STOL) aircraft design criteria. To accomplish this end, two OV-1A aircraft were selected that were participating in air-assault maneuvers. Approximately 200 hours of flight data were recorded within approximately 10 weeks. The parameters recorded were: airspeed, altitude, outside air temperature, and acceleration at the aircraft center of gravity. In addition, supplementary data were collected on the type of mission and gross weight of the aircraft. These data are presented as several frequency-of-occurrence forms, exceedance curves, and gust spectra.

## FOREWORD

This program was sponsored by the Aeromechanics Division and was performed by the Engineering Laboratories Division of the United States Army Aviation Materiel Laboratories (USAAVLABS), Fort Eustis, Virginia. A contractor, Technology, Inc., provided assistance in data collection and reduction. Acknowledgment is given to Mr. Joseph Braun, Mr. C. G. Peckham, Mr. J. F. Nash, Mr. W. E. Morrin, and Mr. David Etter of Technology, Inc., for their contributions to this report and to Dr. R. G. Loewy, who served as consultant for the program. A special acknowledgment is extended to Mr. Larry E. Clay of Technology, Inc., for his help in writing the Results portion of this report.

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## INTRODUCTION

A 203.9-hour statistical sample was collected on two operational aircraft of the 1st Cavalry Division, Airmobile (formerly 11th Air Assault Division). The data were recorded primarily in the maneuver area around Lugoff, South Carolina, from 9 September until mid-November 1964. The data recorded consisted of four parameters: airspeed, altitude, outside air temperature, and acceleration at approximately the aircraft center of gravity. In addition, supplementary data consisting of barometric pressure, ambient temperature, and gross weights of the aircraft before and after the flight were collected for each flight. The types of missions flown were as follows:

Mission I: Tactical training, assault force mobility, combat support mobility, aerial command post, reconnaissance - general, screening/surveillance, air escort, combat service support, and test flights.

Mission II: Fundamental training, radio relay, messenger, photo, and administrative.

The data were presented in several frequency-of-occurrence forms:

1. Diagram and tabulation of maneuver load factors versus equivalent airspeed, average time per flight, and so forth.
2. Histograms showing the percentages of flight time spent in selected ranges of the recorded parameters.
3. Exceedance curves showing the number of hours required to reach or exceed both maneuver and gust normal load factors.

In addition, for each incremental gust-induced acceleration above 5 feet per second, a gust velocity was derived; from these results, a gust spectrum was plotted and a tabulation was made of altitude versus derived gust velocity.

## OBJECTIVES

The primary objectives of this program were:

1. To provide operational data for establishing future STOL aircraft design criteria.

2. To accumulate a minimum statistical sample of 200 flight hours of valid OV-1A operational data.
3. To present this information in a form for use by aircraft designers depicting U. S. Army field usage.
4. To perform limited preliminary analysis on these results.

### METHOD

Two OV-1A aircraft were selected to obtain a minimum statistical sample of 200 flight hours of operational data. The aircraft were property of the 226th Aerial Surveillance and Escort Battalion of the 1st Cavalry Division, Airmobile. The maneuvers conducted from September until mid-November 1964 were of particular interest in that combat was simulated using the most advanced operational air-assault tactics. The two aircraft monitored during this maneuver were armed and flown on missions of low-level troop fire support and helicopter escort in addition to more routine missions.

Figure 1 is a schematic showing the instruments used to record continuously the parameters of altitude, airspeed, outside air temperature, and acceleration at the aircraft center of gravity. Calibrations were performed on all transducers as follows:

1. A "turnover" of  $\pm 1g$  was performed on the accelerometers in the field.
2. The altitude and airspeed transducers were connected to the aircraft Pitot-static system, and the entire system was recalibrated with a pressure standard in the field.
3. The temperature gauge was calibrated with a standard mercury-in-glass thermometer after installation.

Reference channels recorded along with the operational data included two mechanical reference traces timing marks at 1 pulse per second and a voltage monitor trace. The bridge balance unit was used for balancing each circuit prior to each flight and for inserting a fixed calibration signal on each analog channel per record. The chart speed was approximately 4 inches per minute, which allowed recording of up to 7-1/2 hours of flight time per 150-foot roll of oscillographic paper. The recording system was wired to start when the engine ignition switch was turned on and stop when this switch was turned off.

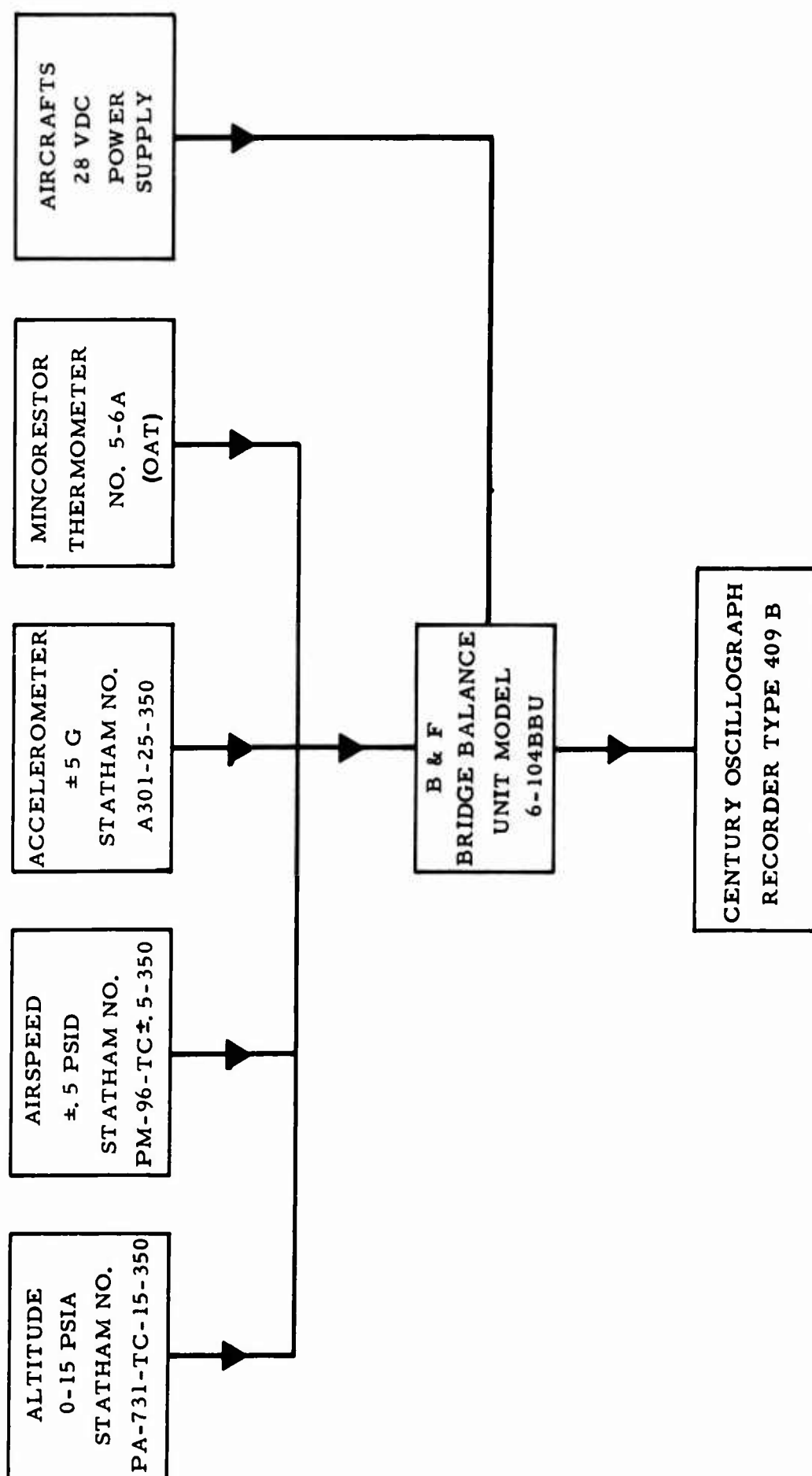


Figure 1. Block Diagram of OV-1A Recording System.

When approximately 7 hours of flight time had been recorded, the record was removed, developed in the field, marked, and sent to the data reduction facility at Technology, Inc., Dayton, Ohio.

At Technology, Inc., the data were scanned a second time for validity, and each record was converted to computer cards by using the semi-automatic Benson-Lehner Oscar K data readers. The basic methods of reducing the data involved reproducing the analog traces by reading the records at varying time intervals not exceeding 2 minutes of flight, depending on the activity of the particular trace. In addition, whenever an acceleration reading peaked outside of the  $\pm 0.25g$  threshold, all traces were read at that instant. These tabulations were converted to magnetic tape and combined with a computer program to obtain the print-outs in this report.

The most interesting calculation was that of derived gust velocity ( $U_{de}$ ) for each gust-induced acceleration. The equation used was as follows:

$$U_{de} = \frac{1.1850 W n_z}{m \rho_o S V_e K_g}$$

where  $U_{de}$  = derived gust velocity, feet per second

$W$  = gross weight, pounds

$\Delta n_z$  = incremental gust load factor =  $n_z - 1.0$

$m$  = lift curve slope (per radian) = + 4.86

$\rho_o$  = sea level density = 0.0023779 slugs per cubic foot

$S$  = wing area = 330 square feet

$V_e$  = equivalent airspeed, knots

$K_g$  = gust factor, defined as follows:

$$K_g = \frac{0.88 \mu_g}{5.3 + \mu_g}$$

and

$$\mu_g = \frac{2W / \rho_o}{m \sigma \bar{z} S g}$$

where

$g$  = dimensional constant = 32.174  
feet per second squared

$\sigma$  = density ratio  $\rho/\rho_0$

$\bar{c}$  = mean aerodynamic chord = 8.15 feet

$\rho$  = density, slugs per cubic foot

Substitution of the constant values into the equation for  $U_{de}$  yielded

$$U_{de} = (938.35\sigma + 0.3531W) \frac{\Delta n_z}{V_e}.$$

At the conclusion of the 200-hour data collection on the OV-1A, the instrumentation was removed and modified for use on other U. S. Army aircraft.

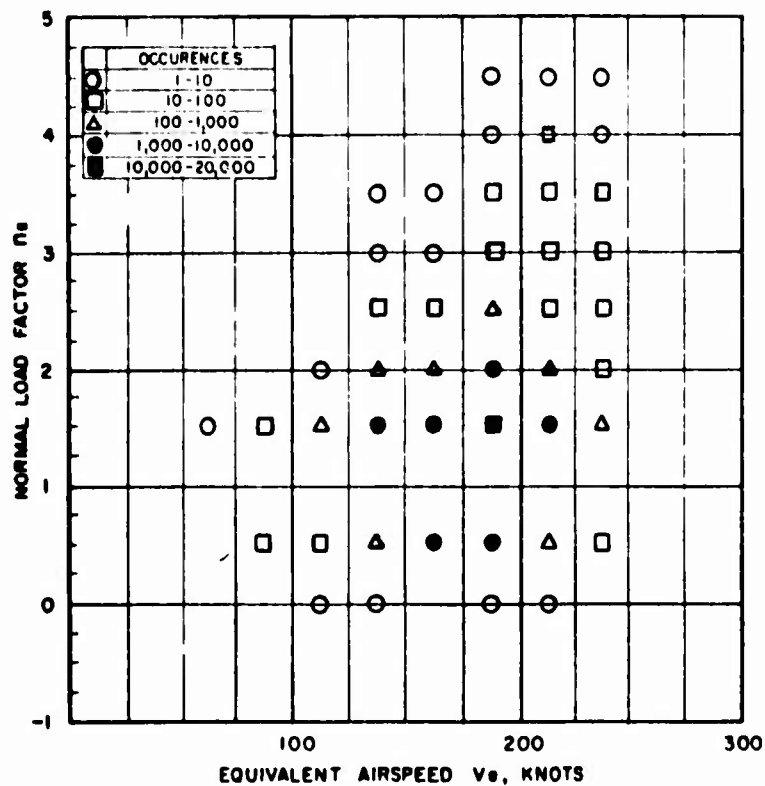
## RESULTS

Results of this program are shown in Figures 2 through 18 and in the computer print-out tables in the appendix of this report.

In order to compute only gust velocities,  $U_{de}$ , over a 5-foot-per-second threshold, a  $\pm 0.25g$  limit was set for reading changes in vertical acceleration. Values of  $U_{de}$  were derived primarily from changes in vertical acceleration. It is possible that not all  $U_{de}$ 's above this threshold were derived, since a combination of high gross weights accompanied by minimum airspeeds and low altitudes could have resulted in small changes in vertical accelerations, in spite of some significant gusts. As a result, the gust spectra presented in this report may be biased for  $U_{de}$  ranges below an estimated 20 feet per second.

Figures 2 through 18 are briefly described in the following:

Figure 2 shows a diagram and a tabulation of  $n_z$  data. The symbols in this figure denote the number of maneuver load factors in combinations of airspeed and load factor ranges. The design limit load factor of 7.33g was not exceeded in the data collected during this program. Mission I flights comprised nearly two-thirds of all flights, and Figure 3 shows that the average time per flight was longer for Mission I than



LOAD FACTOR $n_z$	EQUIVALENT AIRSPEED $V_e$ , KNOTS								TOTAL $n_z$
	LESS THAN 75	75 To 100	100 To 125	125 To 150	150 To 175	175 To 200	200 To 225	225 AND ABOVE	
ABOVE 4.75									
4.25 To 4.75						1	2	1	4
3.75 To 4.25						2	16	3	21
3.25 To 3.75				2	1	22	62	25	112
2.75 To 3.25				1	6	50	37	12	106
2.25 To 2.75				23	97	223	83	21	447
1.75 To 2.25			6	161	813	1306	240	19	2545
1.25 To 1.75	1	48	271	1681	9795	12530	1386	86	25798
0.25 To 0.75		18	73	432	2067	2920	273	22	5805
-0.25 To 0.25			1	2		8	2		13
TIME (min)	2.0	61.9	392.7	1252.9	4309.9	5499.0	686.0	29.8	12334.4

Figure 2. Diagram and Tabulation of Maneuver Load Factors Versus Equivalent Airspeed - Composite for All Missions, OV-1A.

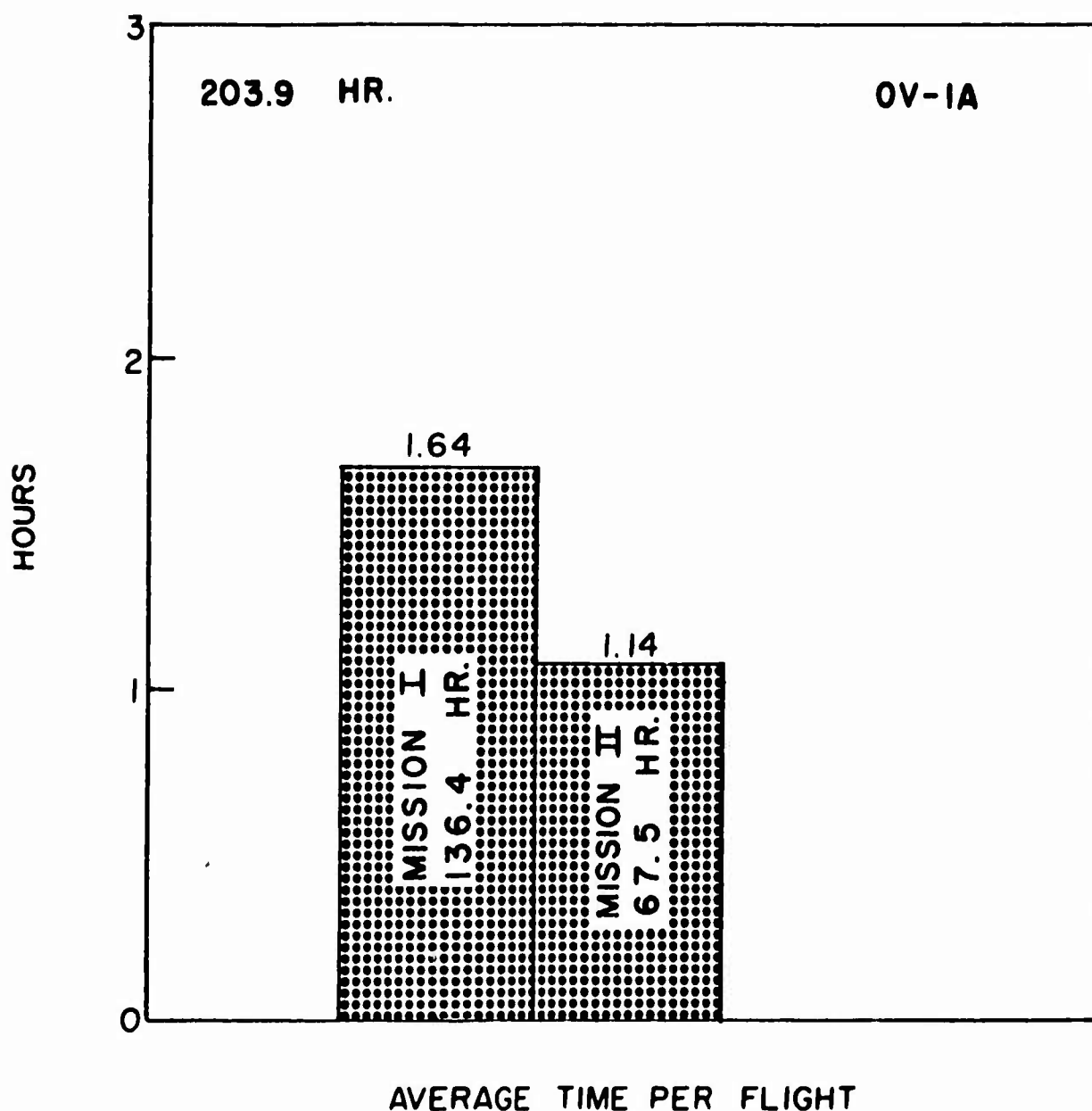


Figure 3. Average Time per Flight by Mission Types.

for Mission II. The percentages of flight time spent at selected airspeeds are presented in Figures 4 and 5.

Mission I flights are, in general, characterized by a faster acceleration to the cruise airspeed and a larger percentage of time at the cruise value than Mission II flights. Over 50 percent of the time of Mission I flights is spent in the 175- to 200-knot airspeed block; nearly 40 percent of the time of Mission II flights is spent in the 150- to 175-knot airspeed block.

The percentages of flight time spent at selected altitudes (Figures 6 and 7) show a very distinct difference between missions. Over 88 percent of the Mission I flights fall in the altitude range of from 0 to



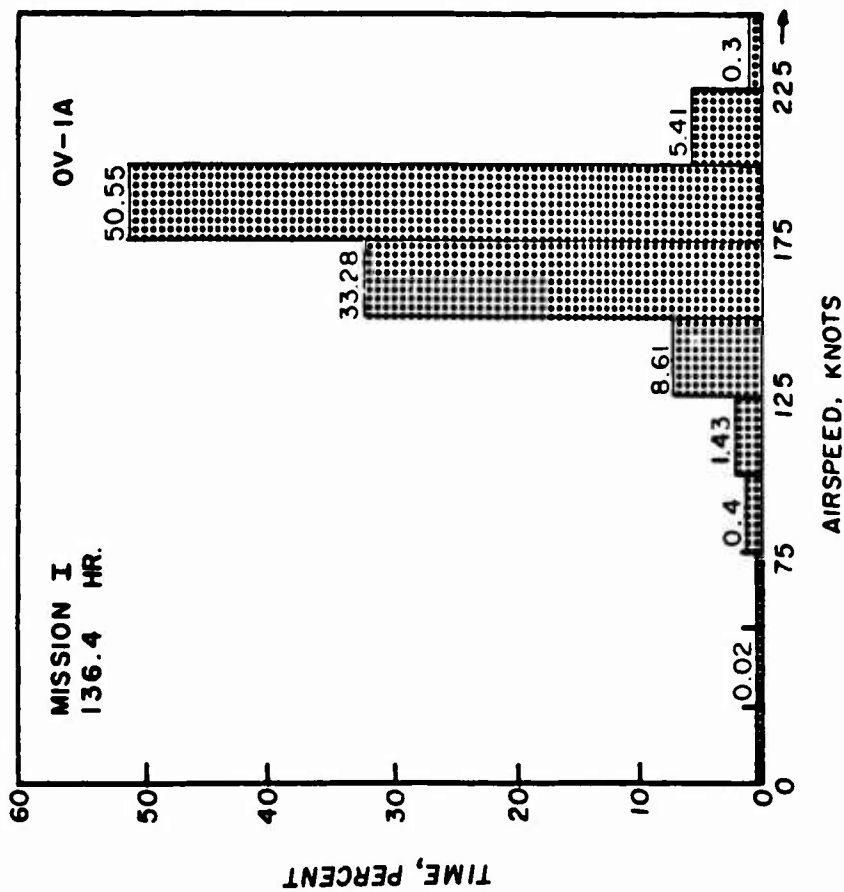


Figure 4. Percentages of Flight Time Spent at Selected Airspeeds - Mission I.

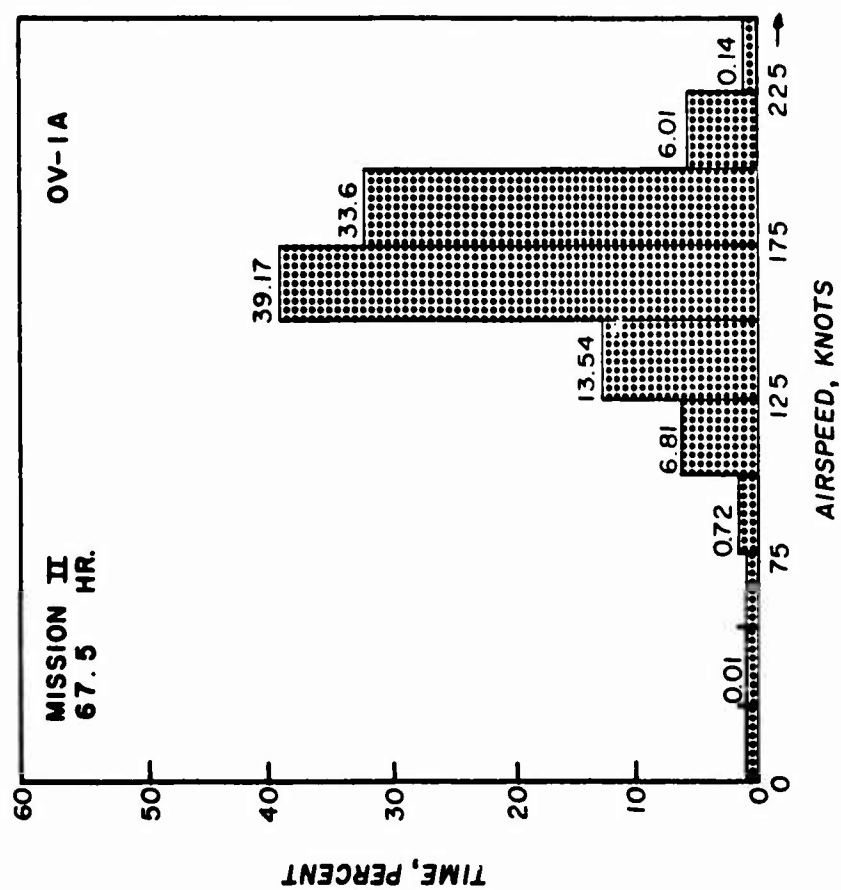


Figure 5. Percentages of Flight Time Spent at Selected Airspeeds - Mission II.

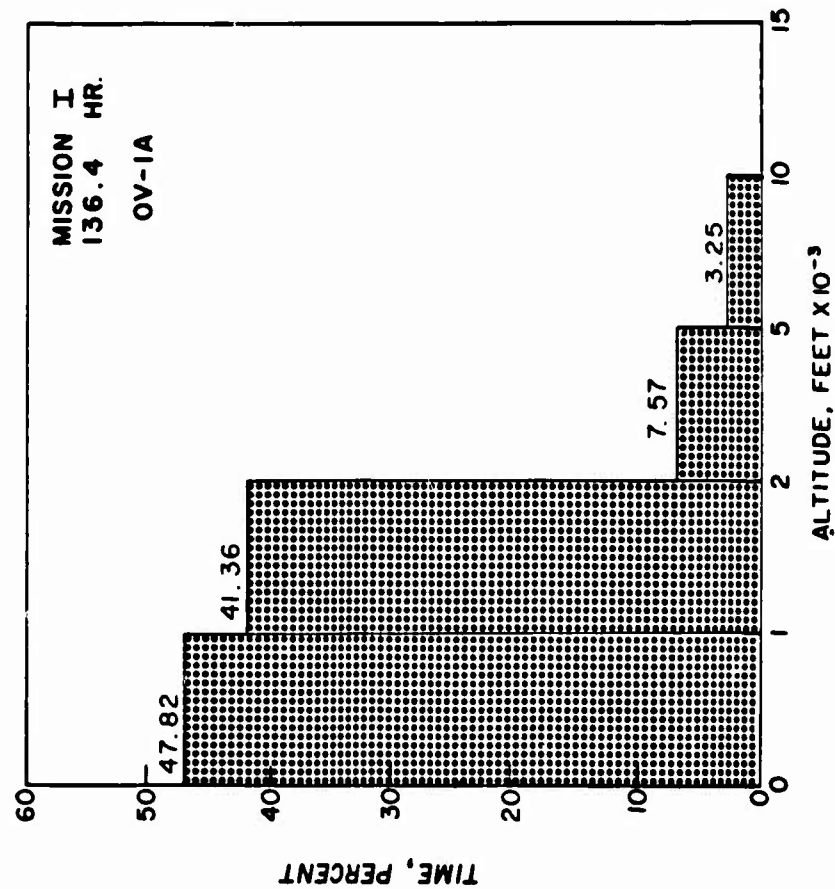


Figure 6. Percentages of Flight Time Spent at Selected Altitudes - Mission I.

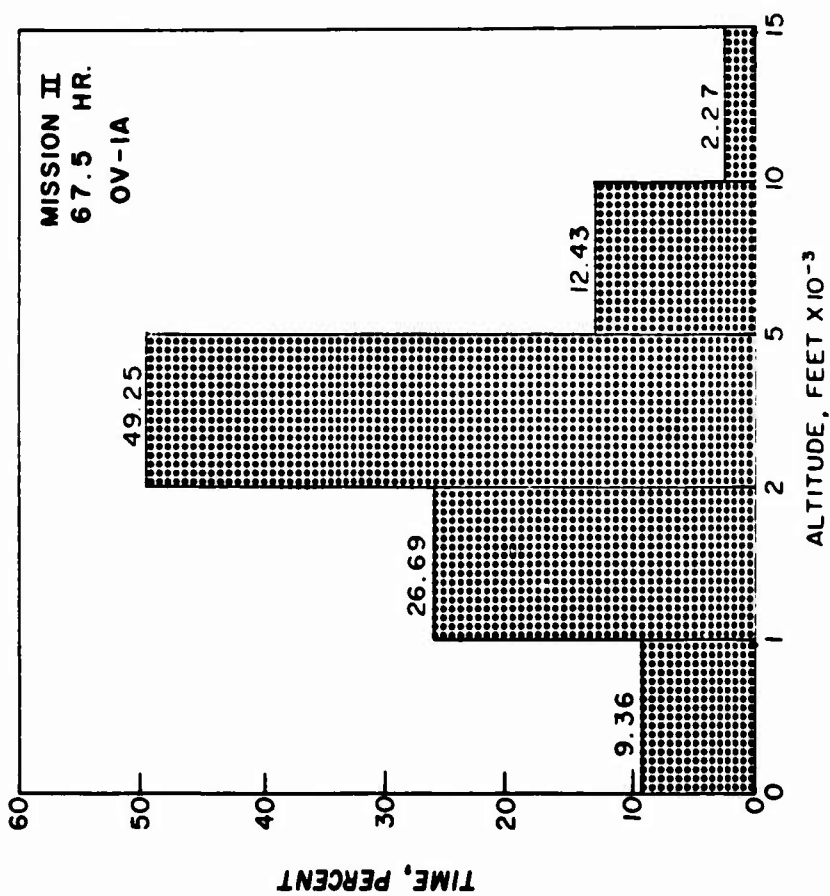


Figure 7. Percentages of Flight Time Spent at Selected Altitudes - Mission II.

2,000 feet, and 50 percent of the Mission II flights fall in the range of from 2,000 to 5,000 feet. This is to be expected, since Mission I flights are mainly of a ground support and surveillance type, whereas Mission II flights contain a large amount of cross-country flying that takes place at generally higher altitudes. A major result of the low-altitude flying of Mission I is that over three times as many gusts were encountered during this mission as during Mission II.

The percentages of flight time spent in selected gross weight ranges shown in Figures 8 and 9 indicate no definite difference between missions. Both missions had a majority of time in the gross weight range of from 13,000 to 14,000 pounds. The largest takeoff gross weight for both missions was 15,269 pounds.

Figure 10 presents the percentages of flight time spent in selected outside air temperature ranges and indicates that the majority of time was spent between the temperatures of 50° and 80° F.

The normal acceleration of the aircraft center of gravity for maneuvers is given as both the normal load factor,  $n_z$ , and the equivalent normal load factor,  $n_{ze}$ . The equivalent normal load factor is defined as follows:

$$n_{ze} = \frac{W_1}{W_d} \cdot n_z,$$

where

$n_z$  = normal load factor

$W_1$  = instantaneous gross weight

$W_d$  = design gross weight = 11,715 pounds

For both  $n_z$  and  $n_{ze}$ , the values recorded during Mission I were more severe than those recorded during Mission II. Four  $n_z$  peaks above 4.25g and two  $n_{ze}$  values above 4.75g were recorded. Their corresponding values of airspeed, altitude, and gross weight are listed in Table I.

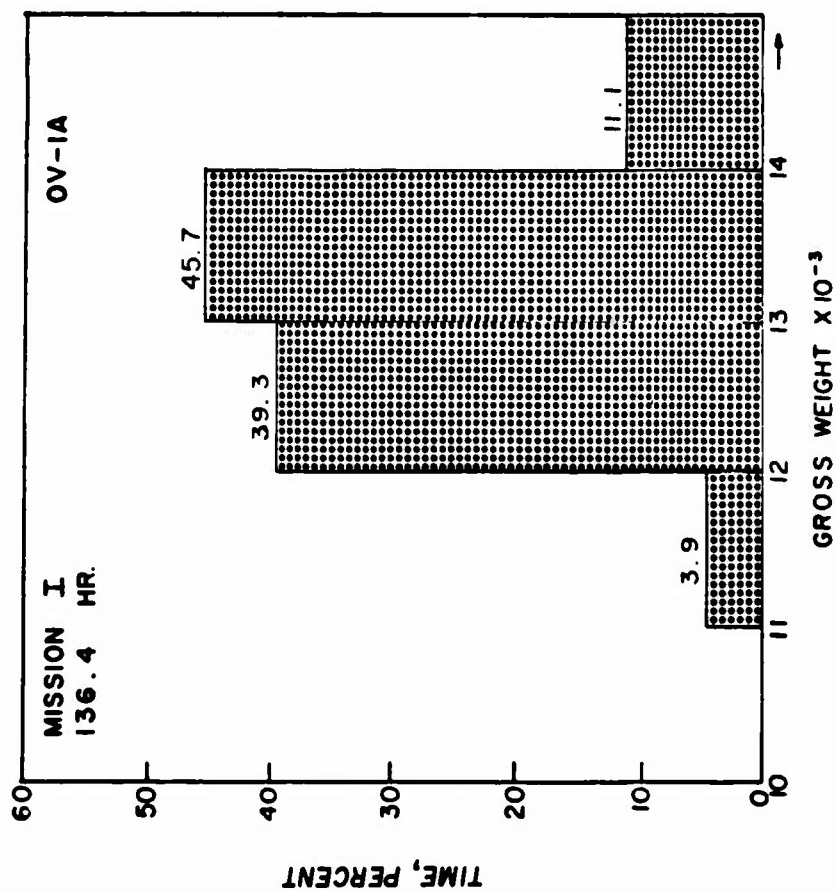


Figure 8. Percentages of Flight Time Spent in Selected Gross Weight Ranges - Mission I.

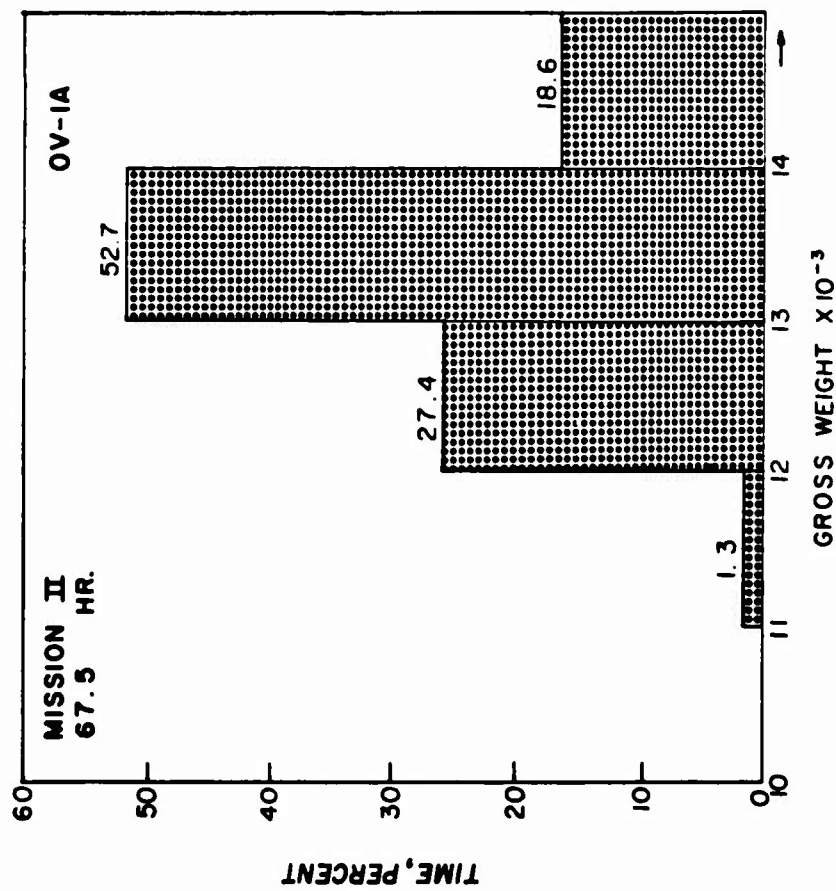


Figure 9. Percentages of Flight Time Spent in Selected Gross Weight Ranges - Mission II.

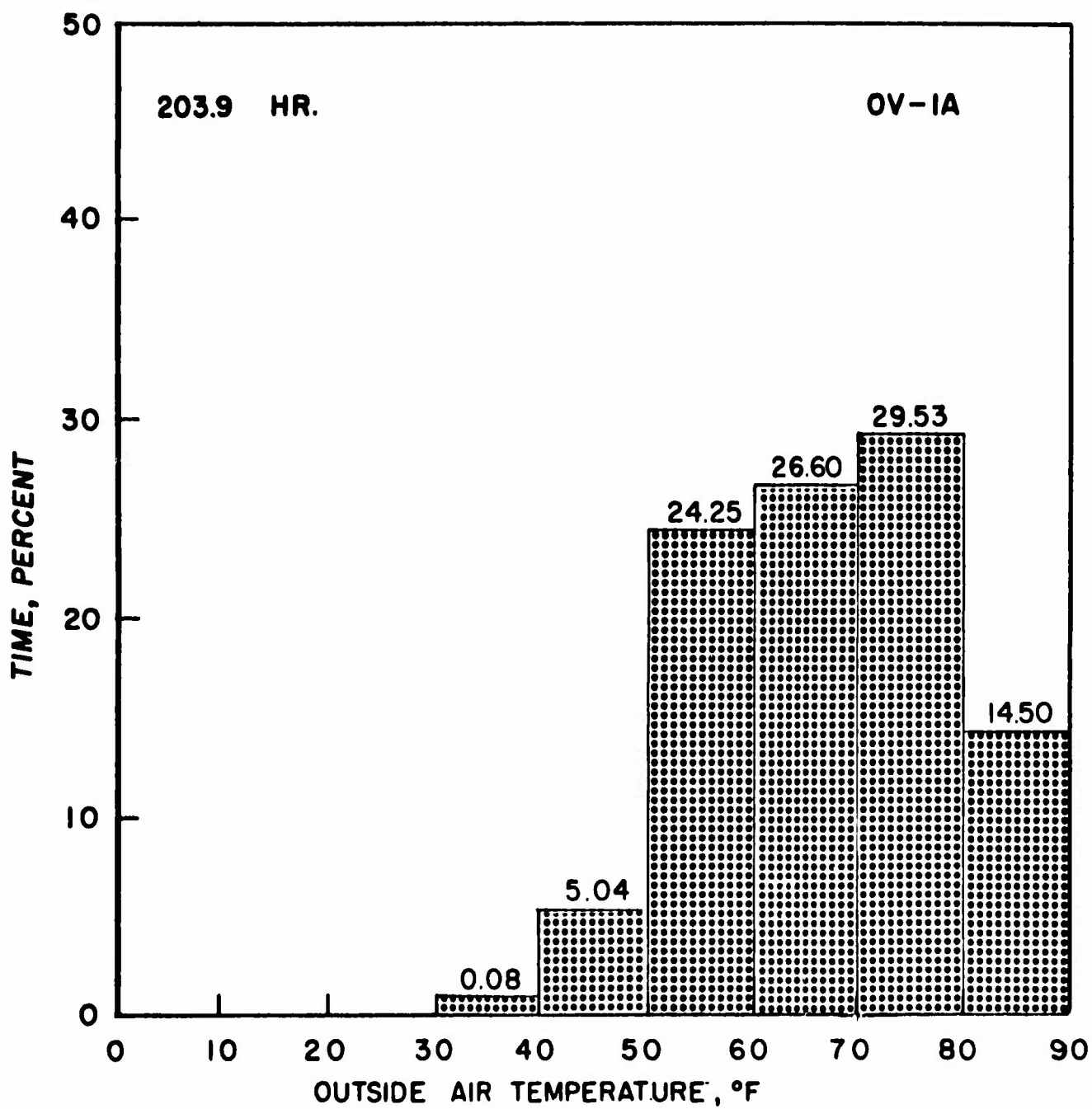


Figure 10. Percentages of Flight Time Spent in Selected Outside Air Temperature Ranges -Composite for All Missions.

TABLE I  
HIGH VALUES FOR  $n_z$

$n_z$	$n_{ze}$	Airspeed (Knots)	Altitude (Feet)	Gross Weight (Pounds)
4.18	4.94	211	888	13,841
4.25	4.37	203	1,000	12,082
4.27	4.73	203	927	13,758
4.28	4.51	215	828	12,330
4.34	4.97	226	1,500	13,418

All values were recorded during Mission I. The highest  $n_z$  block reached during Mission II was from 2.25 to 2.75g, which had four points recorded; the highest  $n_{ze}$  block was from 2.75 to 3.25 g, which had one point recorded.

Maneuver load factor exceedance curves indicating the time required to reach or exceed given maneuver load factors are presented in Figures 11 through 13. The exceedance values for Mission I are considerably more severe than those for Mission II. Figures 14 through 16 show the equivalent maneuver load factor exceedance curves and indicate that the exceedance values are more severe for Mission I than for Mission II.

The distances in nautical miles required to reach or exceed given derived gust velocity values for selected altitude ranges are given in Figure 17. Of the 54,255  $U_{de}$  occurrences tabulated, 5,815 were within the threshold of -5 to +5 feet per second. The two highest  $U_{de}$ 's recorded were between 30 and 35 feet per second. The gust spectrum presented in Figure 18 is based on U. S. Air Force data and is used as a standard by the U. S. Air Force.\* It provides a basis of comparison for the OV-1A gust spectrum.

\*Erwin Joseph, The Spectrum of Turbulence for Aircraft Fatigue Analysis, WCLSSC-10 Memorandum, Wright-Patterson Air Force Base, Ohio, July 1959.

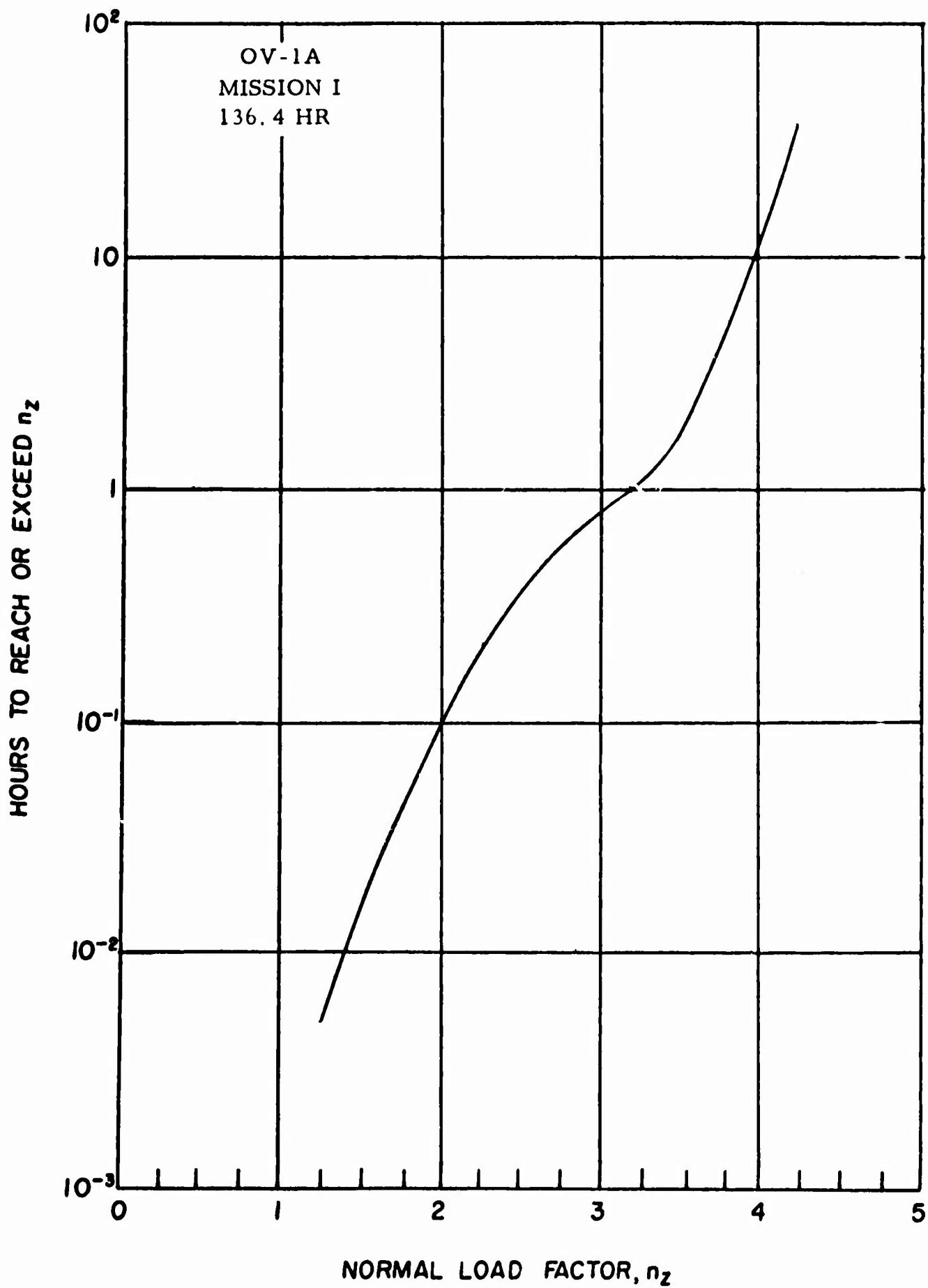


Figure 11. Maneuver Load Factor Exceedance Curve -Mission I.

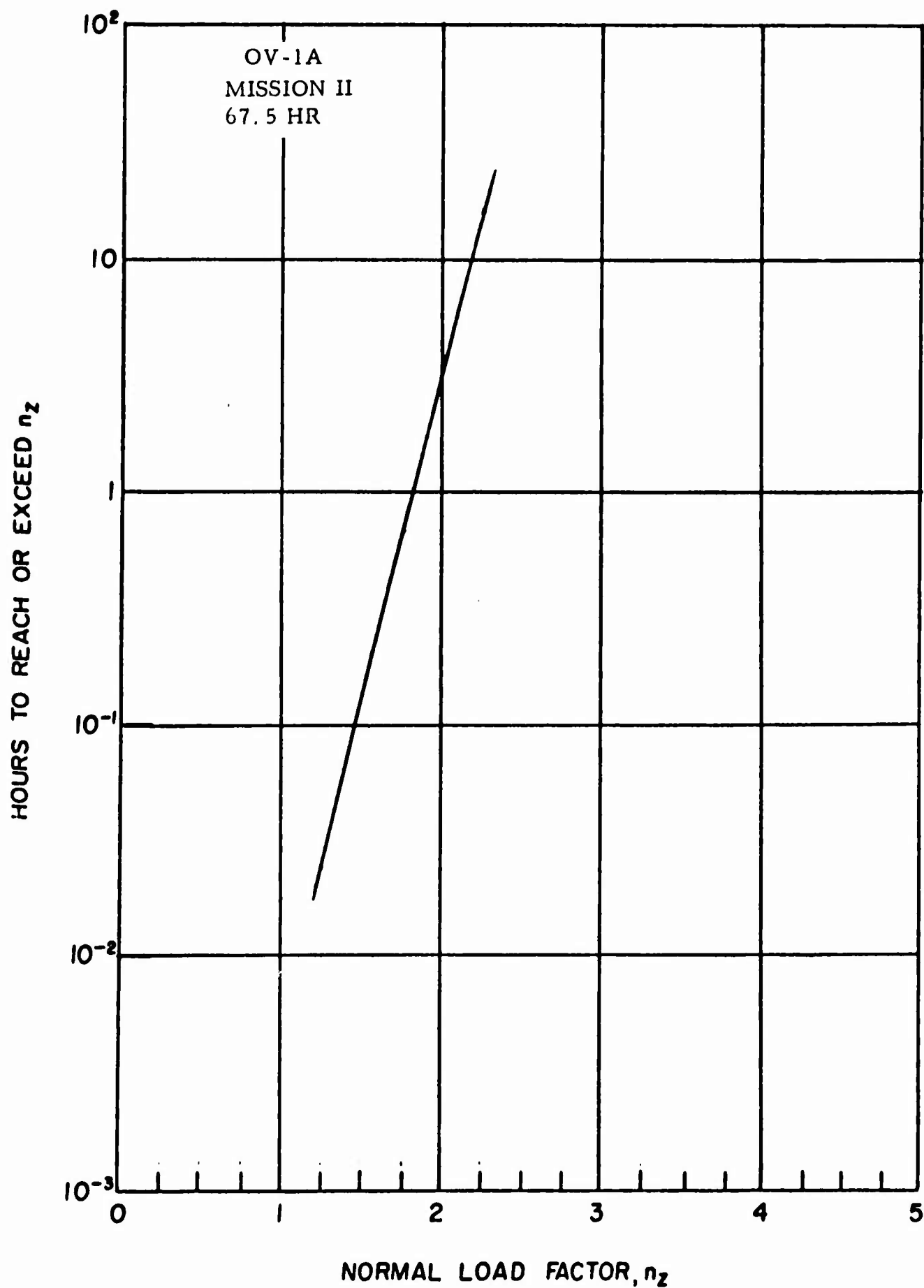


Figure 12. Maneuver Load Factor Exceedance Curve -Mission II.



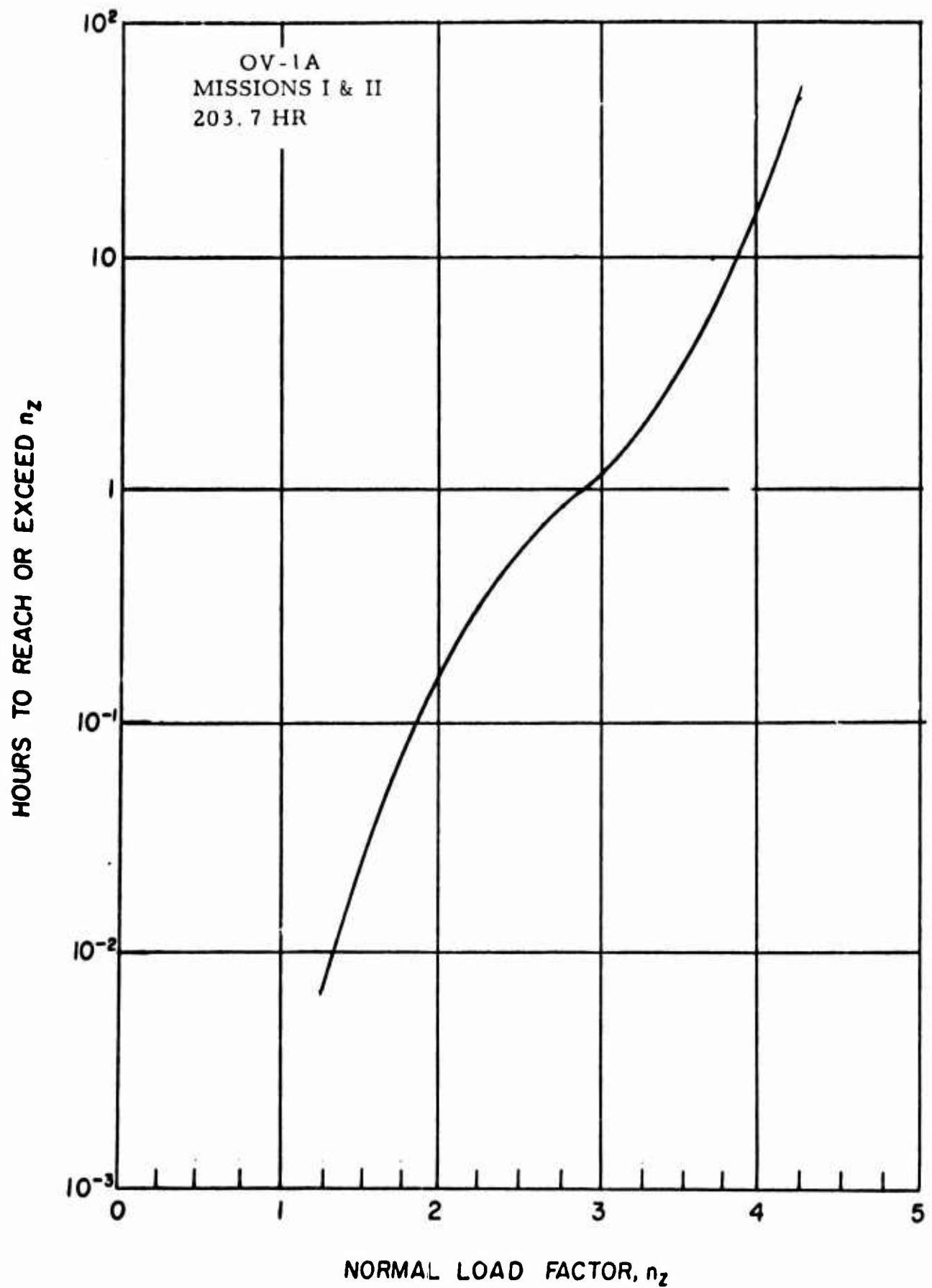


Figure 13. Maneuver Load Factor Exceedance Curve -  
Composite for All Missions.

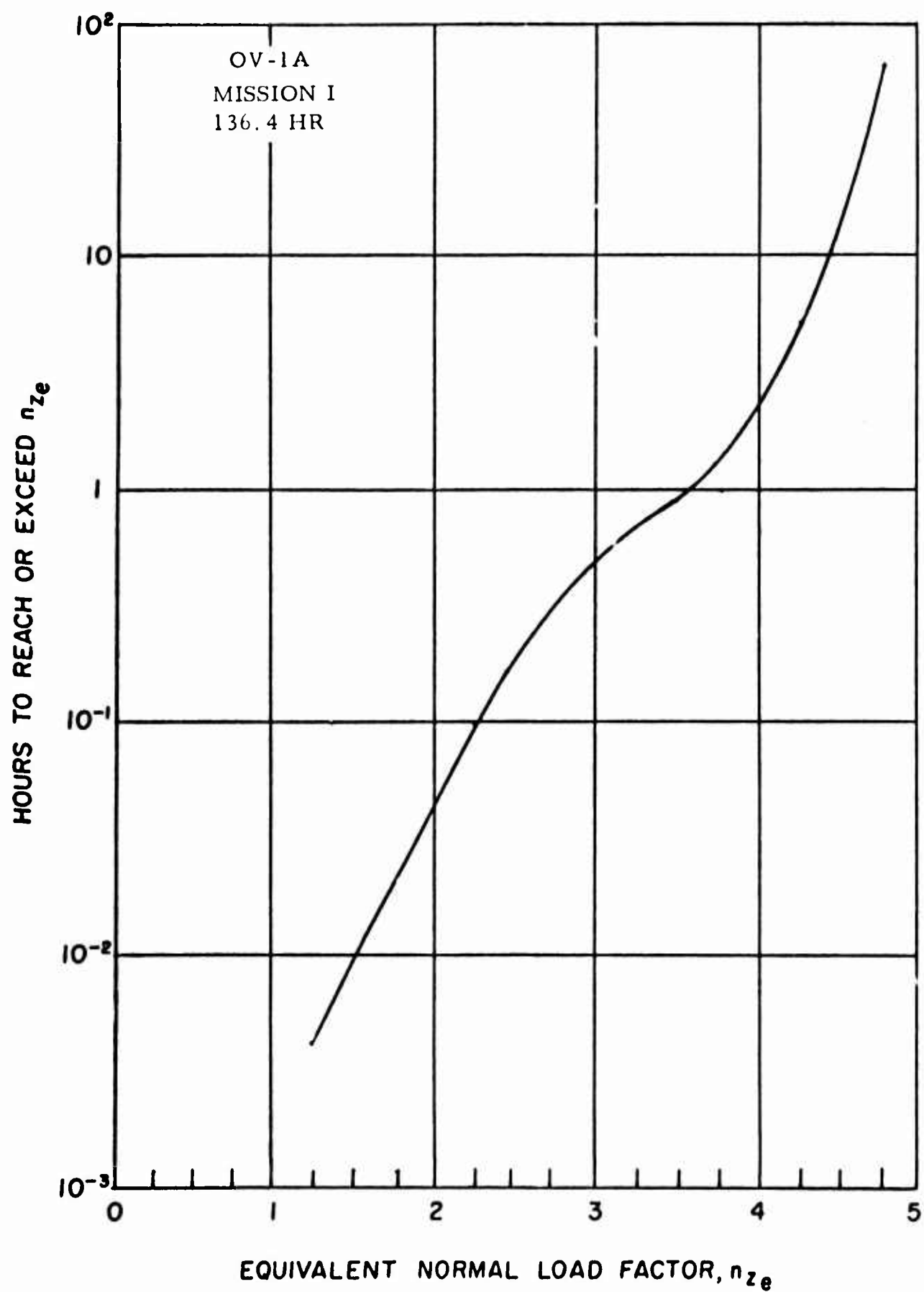


Figure 14. Equivalent Maneuver Load Factor Exceedance Curve - Mission I.

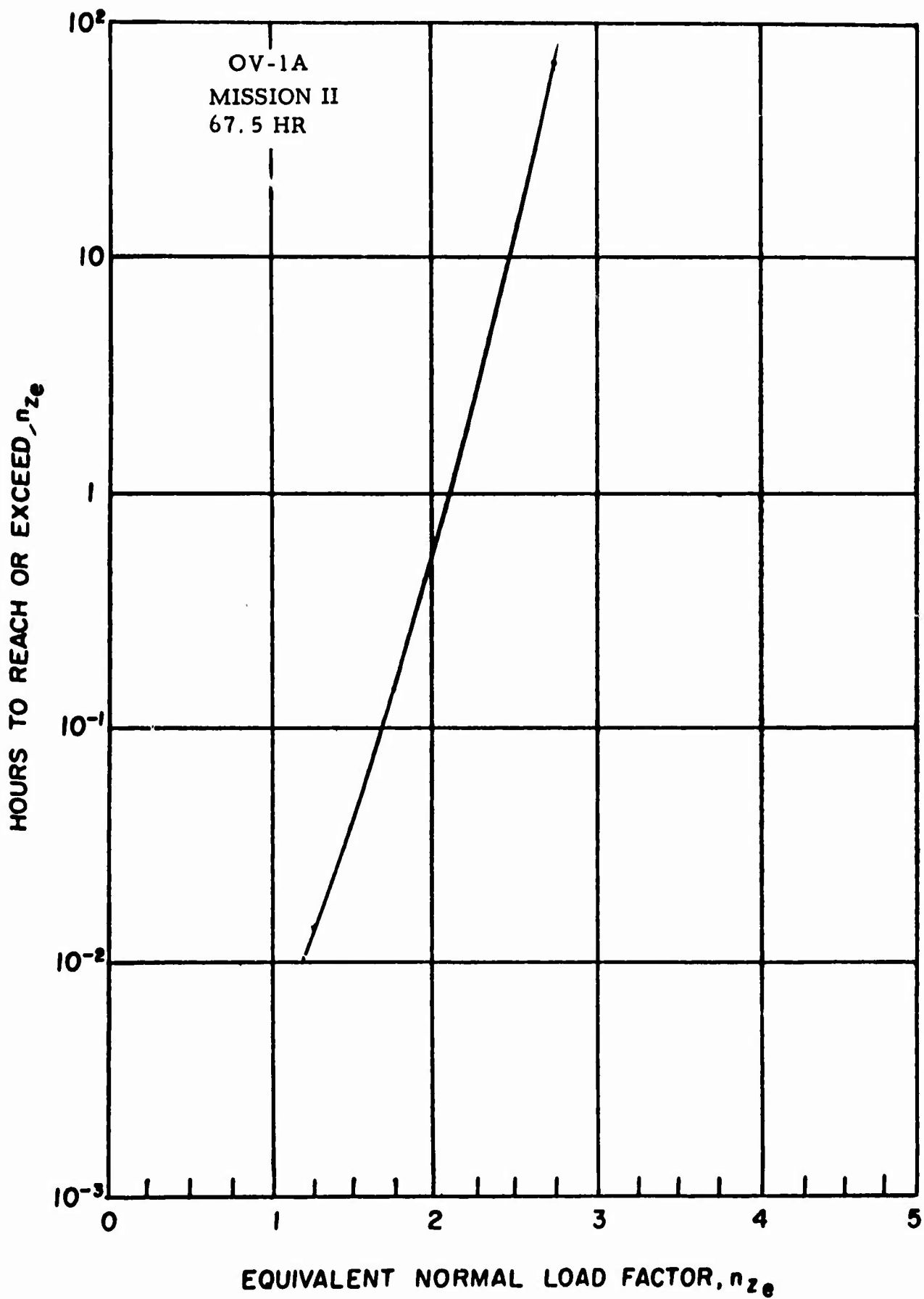


Figure 15. Equivalent Maneuver Load Factor Exceedance Curve - Mission II.

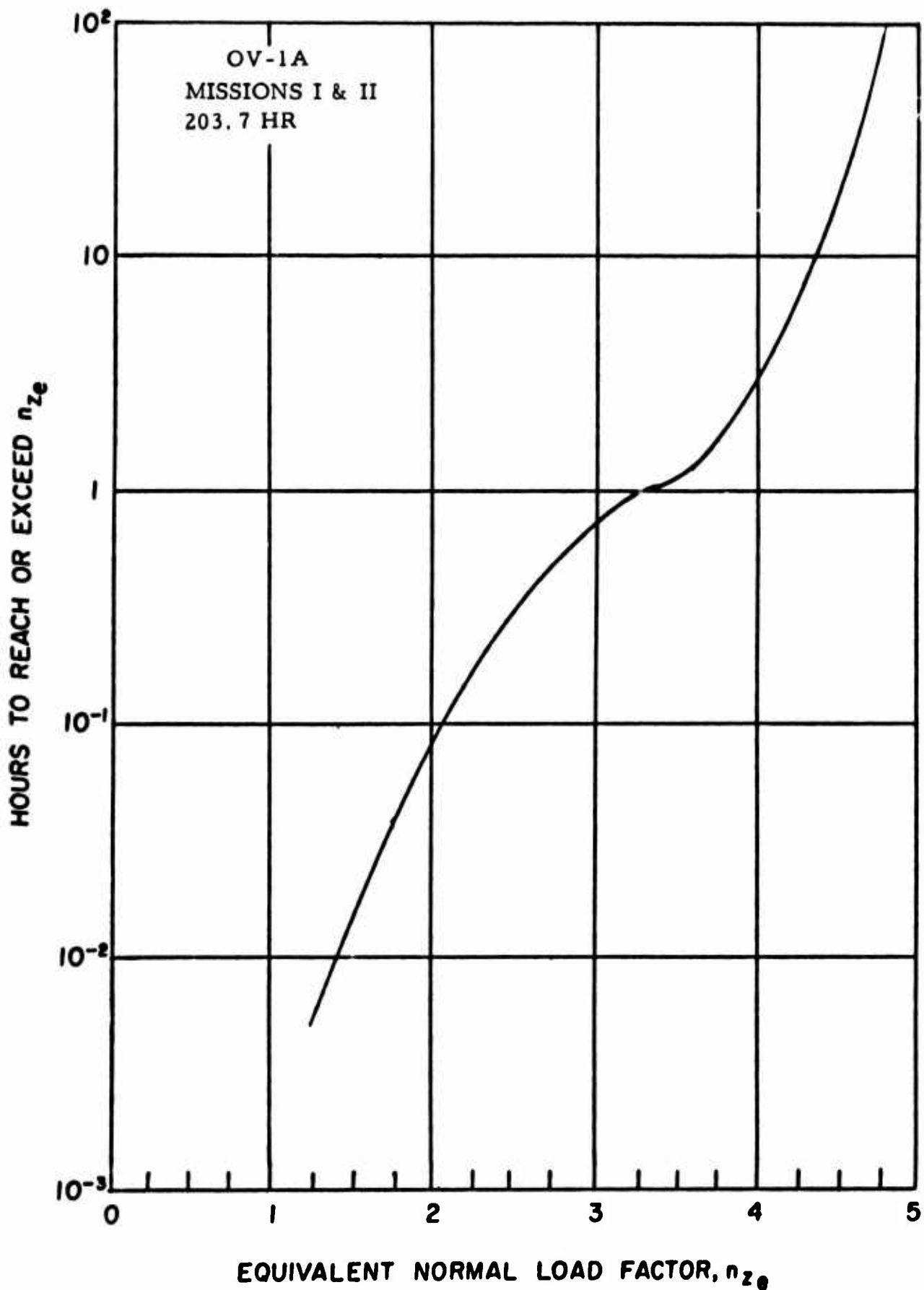
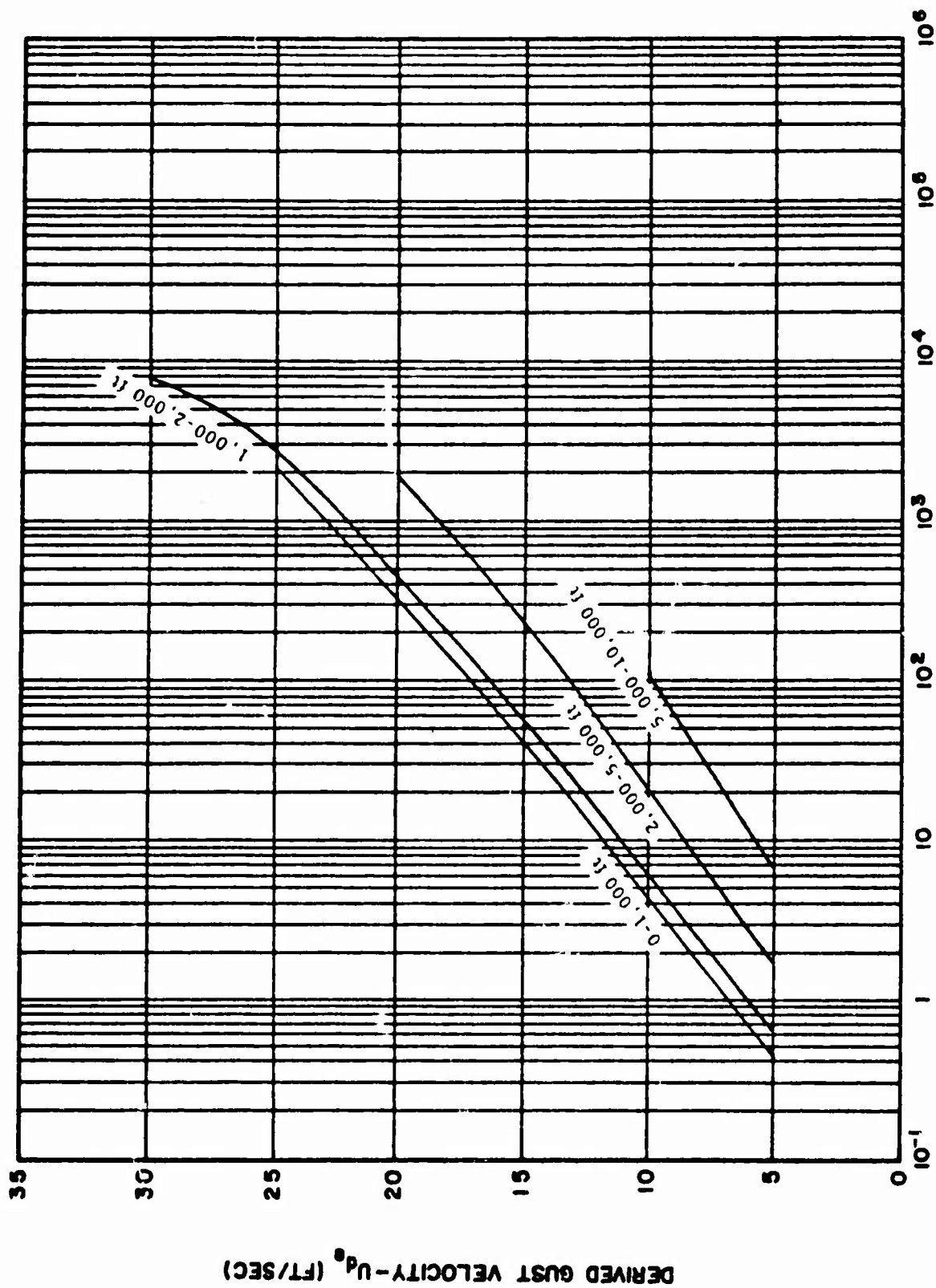


Figure 16. Equivalent Maneuver Load Factor Exceedance Curve -Composite for All Missions.



NAUTICAL MILES TO REACH OR EXCEED DERIVED GUST VELOCITY

Figure 17. Gust Spectrum Based on Data From OV-1A Aircraft.

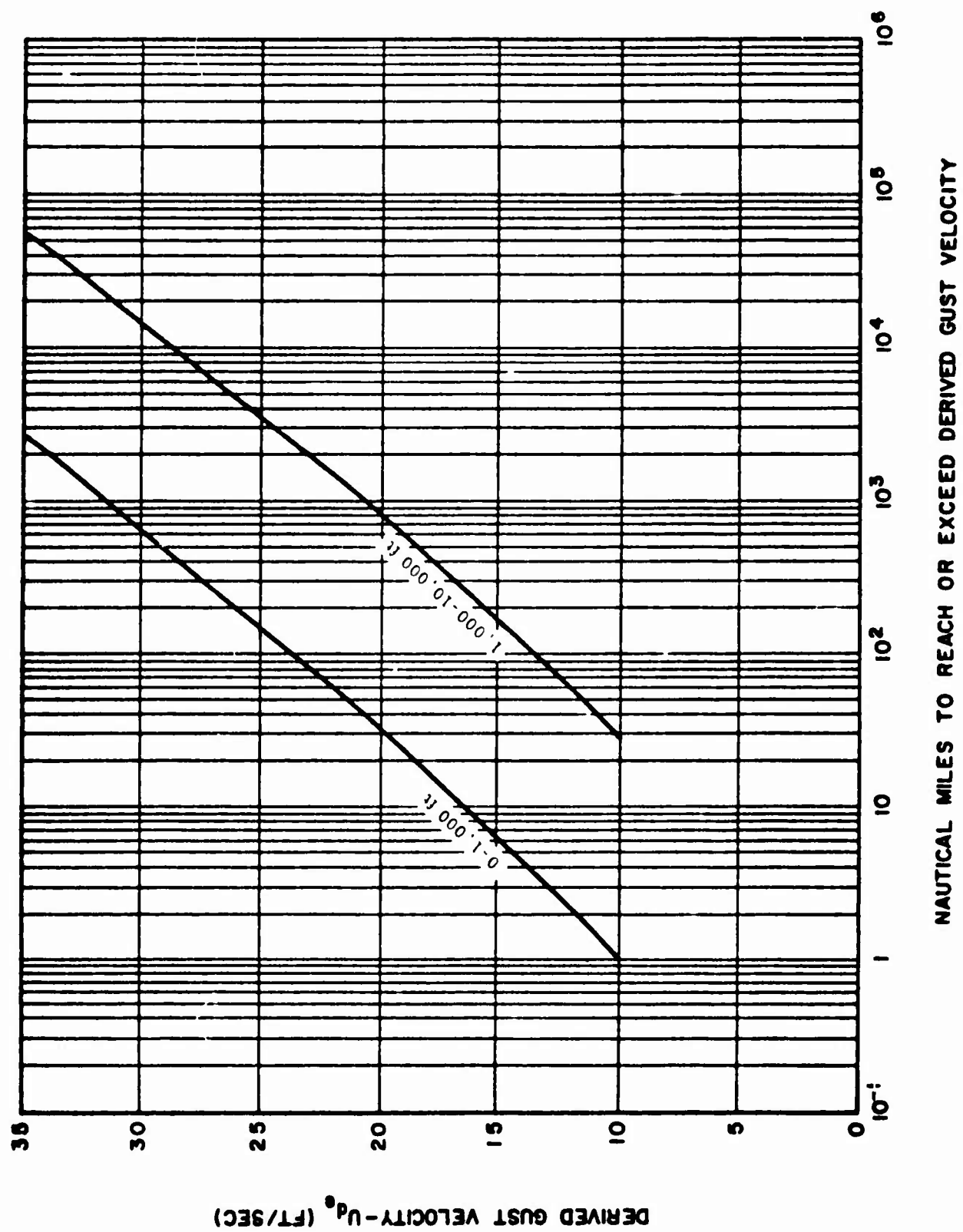


Figure 18. Standard Gust Spectrum.

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## APPENDIX

### FLIGHT DATA PRINT-OUTS

An explanation of Tables II through XVI follows:

1. All tables are computer print-outs.
2. All times are shown in minutes unless otherwise specified. Values of time are rounded off to the nearest one-tenth of a minute.
3. Tables having no points or no time are not included.
4. The range codes for the various parameters are as follows:

#### OUTSIDE AIR TEMPERATURE (° F)

<u>Code</u>	<u>Range</u>
Less	Below 0
0	0 to 10
10	10 to 20
20	20 to 30
30	30 to 40
40	40 to 50
50	50 to 60
60	60 to 70
70	70 to 80
80	80 to 90
90	Above 90

#### AIRSPEED (Knots)

<u>Code</u>	<u>Range</u>
Less	Below 75
75	75 to 100
100	100 to 125
125	125 to 150
150	150 to 175
175	175 to 200
200	200 to 225
225	Above 225

#### ALTITUDE (Feet)

#### WEIGHT (Pounds)

<u>Code</u>	<u>Range</u>	<u>Code</u>	<u>Range</u>
Less	Below 10,000	Less	Below 1,000
10,000	10,000 to 11,000	1,000	1,000 to 2,000
11,000	11,000 to 12,000	2,000	2,000 to 5,000
12,000	12,000 to 13,000	5,000	5,000 to 10,000
13,000	13,000 to 14,000	10,000	10,000 to 15,000
14,000	Above 14,000	15,000	15,000 to 20,000
		20,000	20,000 to 25,000
		25,000	Above 25,000

$U_{de}$ (Feet per Second)		DELTA $n_z$ ( $n_z - 1.0$ ), MANEUVER $n_z$ , AND EQUIVALENT MANEUVER $n_{ze}$ (g)	
<u>Code</u>	<u>Range</u>	<u>Code</u>	<u>Range</u>
Less	Below -40	Less	Below -1.25
-40	-40 to -35	-1.25	-1.25 to -0.75
-35	-35 to -30	-0.75	-0.75 to -0.25
-30	-30 to -25	-0.25	-0.25 to 0.25
-25	-25 to -20	0.25	0.25 to 0.75
-20	-20 to -15	0.75	0.75 to 1.25
-15	-15 to -10	1.25	1.25 to 1.75
-10	-10 to -5	1.75	1.75 to 2.25
-5	-5 to 0	2.25	2.25 to 2.75
0	0 to 5	2.75	2.75 to 3.25
5	5 to 10	3.25	3.25 to 3.75
10	10 to 15	3.75	3.75 to 4.25
15	15 to 20	4.25	4.25 to 4.75
20	20 to 25	4.75	Above 4.75
25	25 to 30		
30	30 to 35		
35	35 to 40		
40	40 to 45		
45	Above 45		

An explanation of the print-out code shown on the left of the tables follows:

For the letters MMWA, the first M represents the model, the second M represents mission, W represents weight, and A represents altitude.

The first numeral represents the model number. (There was only one model during this data collection, so the model number is always 1.)

The second numeral represents the mission number. (There were two missions during the collection, numbered 1 and 2.)

The letters A through F are the weight codes as follows:

A - below 10,000 pounds

B - 10,000 pounds

C - 11,000 pounds

D - 12,000 pounds

E - 13,000 pounds

F - 14,000 pounds

TABLE II  
TIME FOR ALTITUDE VERSUS AIRSPEED  
BY OUTSIDE AIR TEMPERATURE

		Time (Minutes) for Altitude Versus Velocity by OAT 30 Deg. F							
Vel (Kts.)	Alt. (Ft.)	0	75	100	125	150	175	200	Total
0	0	0.1	0.4	1.4	2.4	5.5	0.4	0.2	10.4
1,000									
2,000									
5,000									
10,000									
Total		0.1	0.4	1.4	2.4	5.5	0.4	0.2	10.4

		Time (Minutes) for Altitude Versus Velocity by OAT 40 Deg. F							
Vel (Kts.)	Alt. (Ft.)	0	75	100	125	150	175	200	Total
0	0	0	4.9	10.7	18.2	24.0	12.9	3.7	74.7
1,000			0.5	11.2	60.7	89.3	88.5	16.3	267.7
2,000			2.5	45.8	73.9	86.5	50.5	1.6	261.0
5,000						1.9	10.4	1.8	14.1
10,000									
Total			7.9	67.7	152.8	201.7	162.3	23.4	617.5

		Time (Minutes) for Altitude Versus Velocity by OAT 50 Deg. F							
Vel (Kts.)	Alt. (Ft.)	0	75	100	125	150	175	200	Total
0	0	0.7	7.6	25.6	30.9	217.4	510.1	69.3	866.8
1,000			1.4	90.9	115.2	394.2	576.2	82.2	1,265.3
2,000				65.9	90.0	246.2	203.9	76.3	684.9
5,000					42.9	22.2	79.7	1.7	146.5
10,000									
Total		0.7	9.0	182.4	279.0	880.0	1,369.9	229.5	2,963.5

Time (Minutes) for Altitude Versus Velocity by OAT 60 Deg. F



Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0	0.7	7.6	25.6	30.9	217.4	510.1	69.3	5.2	866.8
1,000		1.4	90.9	115.2	394.2	576.2	82.2	5.2	1,265.3
2,000			65.9	90.0	246.2	203.9	76.3	2.6	684.9
5,000				42.9	22.2	79.7	1.7		146.5
10,000									

Total	0.7	9.0	182.4	279.0	880.0	1,369.9	229.5	13.0	2,963.5
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### Time (Minutes) for Altitude Versus Velocity by OAT 60 Deg. F

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0	0.6	14.3	23.0	67.2	421.4	629.0	50.8	3.5	1209.8
1,000		2.3	26.3	76.2	324.6	491.6	61.5	0.7	983.2
2,000			2.0	80.9	301.6	230.0	24.9	2.0	641.4
5,000				6.9	94.2	275.1	3.1		379.3
10,000					40.5				40.5
Total	0.6	16.6	51.3	231.2	1,182.3	1,625.7	140.3	6.2	3,254.2

### Time (Minutes) for Altitude Versus Velocity by OAT 70 Deg. F

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0	0.6	17.8	35.2	82.8	562.9	803.0	108.8	3.1	1,614.2
1,000		1.6	17.7	96.7	385.4	540.4	37.9	0.7	1,080.4
2,000			1.2	47.1	329.0	295.7	58.1		731.1
5,000				5.1	39.2	105.3	5.4		155.0
10,000				2.2	28.9	3.7			34.8
Total	0.6	19.4	54.1	233.9	1,345.4	1,748.1	210.2	3.8	3,615.5

### Time (Minutes) for Altitude Versus Velocity by OAT 80 Deg. F

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0		7.7	17.1	33.2	227.2	208.4	24.2	0.5	518.3
1,000		0.9	14.9	249.7	314.7	269.7	19.0	0.3	869.2
2,000			2.5	60.0	128.6	70.2	29.9	3.9	295.1
5,000			1.2	9.5	17.1	36.1	9.7	0.5	74.1
10,000									
Total	0.6	16.6	51.3	231.2	1,182.3	1,625.7	140.3	6.2	3,254.2

Time (Minutes) for Altitude Versus Velocity by OAT 70 Deg. F

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0	0.6	17.8	35.2	82.8	562.9	803.0	108.8	3.1	1,614.2
1,000		1.6	17.7	96.7	385.4	540.4	37.9	0.7	1,080.4
2,000			1.2	47.1	329.0	295.7	58.1		731.1
5,000				5.1	39.2	105.3	5.4		155.0
10,000				2.2	28.9	3.7			34.8
Total	0.6	19.4	54.1	233.9	1,345.4	1,748.1	210.2	3.8	3,615.5

Time (Minutes) for Altitude Versus Velocity by OAT 80 Deg. F

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0		7.7	17.1	33.2	227.2	208.4	24.2	0.5	518.3
1,000		0.9	14.9	249.7	314.7	269.7	19.0	0.3	869.2
2,000			2.5	60.0	128.6	70.2	29.9	3.9	295.1
5,000			1.2	9.5	17.1	36.1	9.7	0.5	74.1
10,000				1.1	7.4	8.1			16.6
Total		8.6	35.7	353.5	695.0	592.5	82.8	5.2	1,773.3

Time (Minutes) for Altitude Versus Velocity Composite - All Temperatures

Vel (Kts.) Alt. (Ft.)	0	75	100	125	150	175	200	225	Total
0	2.0	52.6	112.9	234.7	1,458.5	2,163.8	257.0	12.7	4,294.2
1,000		6.7	161.1	598.5	1,508.2	1,966.4	216.9	8.1	4,465.9
2,000		2.6	117.4	351.9	1,091.8	850.4	190.7	8.6	2,613.4
5,000			1.2	64.4	174.6	506.6	21.7	0.5	769.0
10,000				3.3	76.8	11.8			91.9
Total	2.0	61.9	392.6	1,252.8	4,309.9	5,499.0	686.3	29.9	12,234.4

TABLE III  
TIME (MINUTES) FOR ALTITUDE VERSUS OUTSIDE  
AIR TEMPERATURE - COMPOSITE

OAT (Deg.) F	30	40	50	60	70	80	Total
Alt. (Ft.)							
0	10.4	74.7	866.8	1,209.8	1,614.2	518.3	4,294.2
1,000		267.7	1,265.3	983.2	1,080.4	869.2	4,465.8
2,000		261.0	684.9	641.4	731.1	295.1	2,613.5
5,000		14.1	146.5	379.3	155.0	74.1	769.0
10,000				40.5	34.8	16.6	91.9
Total	10.4	617.5	2,963.5	3,254.2	3,615.5	1,773.3	12,234.4

TABLE IV  
TIME FOR ALTITUDE VERSUS AIRSPEED FOR MISSION I BY WEIGHT

MMW 11C		Equivalent Airspeed - VE (Knots) W - 11,000 lb									
Alt (Feet)	Below	75	100	125	150	175	200	225	Total		
0	0.3	8.0	10.1	5.0	14.9	63.1	1.4				
1,000		1.2	7.9	29.4	64.6	82.0	5.5				
2,000				2.7	9.3	13.6					
5,000											
10,000											
15,000											
20,000											
25,000											
Total	0.3	9.2	18.0	37.1	88.9	158.7	6.9				319.1
MMW 11D		Equivalent Airspeed - VE (Knots) W - 12,000 lb									
Alt (Feet)	Below	75	100	125	150	175	200	225	Total		
0	0.5	9.7	21.8	49.9	403.7	767.0	112.2	3.5			1,368.3
1,000		2.1	21.7	176.8	437.3	732.2	79.5	1.7			1,451.4
2,000			3.0	35.0	84.4	136.4	9.0	5.4			273.2
5,000				6.6	16.2	97.7	3.3	0.5			124.2
10,000											
15,000											
20,000											
25,000											
Total	0.5	11.8	46.5	268.3	941.6	1,733.3	203.9	11.1			3,217.0





MMW 11F

Equivalent Airspeed - VE (Knots) W - i4,000 lb

Alt (Feet)	Below	75	100	125	150	175	200	225	Total
0	0.2	3.9	7.7	19.2	153.5	279.9	36.8	1.7	503.0
1,000		0.2	4.6	22.6	96.1	158.6	21.6	0.1	303.8
2,000			1.0	17.4	35.7	22.9	0.9		77.9
5,000					4.9	18.9			23.8
10,000									
15,000									
20,000									
25,000									
Total	0.2	4.1	13.3	59.2	290.1	480.4	59.3	1.8	908.5

MM 11

Equivalent Airspeed - VE (Knots) All Weights

Alt (Feet)	Below	75	100	125	150	175	200	225	Total
0	1.4	29.3	61.1	185.9	1,341.4	2,040.4	243.9	12.0	3,915.3
1,000		3.5	49.7	412.7	1,096.0	1,644.4	174.3	4.9	3,385.7
2,000			5.1	97.2	234.8	254.4	21.5	6.8	619.8
5,000			1.2	9.1	52.3	199.7	3.3	0.5	266.0
10,000									
15,000									
20,000									
25,000									
Total	1.4	32.8	117.1	704.9	2,724.4	4,138.9	443.0	24.2	8,186.7

## TIME FOR ALTITUDE VERSUS AIRSPEED FOR MISSION II BY WEIGHT

MMW 12C	Alt (Feet)	Equivalent Airspeed - VE (Knots) W - 11,000 lb							
		Below	75	100	125	150	175	200	Total
	0		0.2	2.6	0.9	0.1	0.1	0.3	4.2
	1,000				0.1	9.2	3.8		13.1
	2,000			7.5	4.4	17.2	6.1		35.2
	5,000								
	10,000								
	15,000								
	20,000								
	25,000								
	Total		0.2	10.1	5.5	26.4	9.9	0.3	52.5
MMW 12D	Alt (Feet)	Equivalent Airspeed - VE (Knots) W - 12,000 lb							
		Below	75	100	125	150	175	200	Total
	0	0.1	6.6	11.6	5.6	29.0	9.3	1.9	64.2
	1,000		2.3	67.3	65.0	134.1	87.4	17.3	373.9
	2,000		2.5	49.1	100.8	198.8	142.6	66.0	561.5
	5,000				10.0	36.7	44.8	3.0	94.5
	10,000					12.7	1.9		14.6
	15,000								
	20,000								
	25,000								
	Total	0.1	11.5	128.1	181.4	411.4	286.0	88.2	1,108.7

20,000  
25,000

Total	0.1	11.5	128.1	181.4	411.4	286.0	88.2	2.1	1,108.7
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## MMW 12E

Equivalent Airspeed - VE (Knots) W - 13,000 lb

Alt (Feet)	Below	75	100	125	150	175	200	225	Total
0	0.5	11.5	27.4	26.4	71.8	90.2	6.8	0.7	235.3
1,000		0.4	39.4	78.9	189.2	194.5	24.2	2.7	529.3
2,000			29.9	103.4	382.9	313.7	94.4	0.2	924.5
5,000				42.5	74.0	248.3	15.0		379.7
10,000				2.1	56.7	4.9			63.8

B

Total	0.5	12.0	96.7	253.3	774.6	851.7	140.3	3.5	2,132.7
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## MMW 12F

Equivalent Airspeed - VE (Knots) W - 14,000 lb

[illegible]

(Feet)	Below	75	100	125	150	175	200	225	Total
0		5.0	10.3	16.0	16.2	23.8	4.1		75.3
1,000		0.5	4.6	41.7	79.7	36.2	1.1		163.8
2,000			25.7	46.1	258.2	133.6	8.8		472.4
5,000				2.8	11.6	13.8	0.5		28.7
10,000				1.1	7.4	5.1			13.6
15,000									
20,000									
25,000									
Total		5.5	40.7	107.7	373.1	212.5	14.4		753.9

MM 12

Equivalent Airspeed - VE (Knots) All Weights

Alt (Feet)	Below	75	100	125	150	175	200	225	Total
0	0.6	23.4	51.8	48.8	117.2	123.4	13.1	0.7	379.0
1,000		3.2	111.4	185.8	412.2	321.9	42.6	3.2	1,080.2
2,000		2.5	112.3	254.7	857.0	596.0	169.2	1.8	1,993.6
5,000				55.3	122.3	306.9	18.4		503.0
10,000				3.3	76.8	11.9			91.9
15,000									
20,000									
25,000									
Total	0.6	29.1	275.5	548.0	1,585.5	1,360.1	243.2	5.6	4,047.7

TABLE VI  
TIME FOR ALTITUDE VERSUS AIRSPEED

COMP	Equivalent Airspeed - VE (Knots)									
	Alt (Feet)	Below	75	100	125	150	175	200	225	Total
	0	2.0	52.6	112.9	234.7	1,458.5	2,163.8	257.0	12.7	4,294.2
	1,000		6.7	161.1	598.5	1,508.2	1,966.4	216.9	8.1	4,465.9
	2,000		2.5	117.4	351.9	1,091.8	850.3	190.7	8.6	2,613.4
	5,000			1.2	64.4	174.6	506.6	21.7	0.5	769.0
	10,000				3.3	76.8	11.9			91.9
	15,000									
	20,000									
	25,000									
	Total	2.0	61.9	392.7	1,252.9	4,309.9	5,499.0	686.2	29.8	12,234.4

TABLE VII  
DELTA n<sub>Z</sub> VERSUS AIRSPEED FOR MISSION I BY WEIGHT BY ALTITUDE

Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75				13	152	4			169
-0.75 to -0.25		1		20	148	4			173
-1.25 to -0.75					2				2
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total		1		33	302	8			344
Time (Min)	0.3	8.0	10.1	5.0	14.9	63.1	1.4		102.8

MMWA 11CB

Altitude - 1,000 to 2,000 Feet W - 11,000 lb

Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75				8	80	98	14		200
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total			1	17	164	204	27		413
Time (Min)	1.2	7.9	29.4	64.6	82.0	5.5			190.6

Total 413

Time (Min) 1.2 7.9 17 164 204 27 190.6

MMWA 11CC

Altitude - 2,000 to 5,000 Feet W - 11,000 lb

Equivalent Airspeed - VE (Knots)		Total	
Load Factor	Delta n <sub>z</sub>	225 and Above	Delta n <sub>z</sub>
Above 3.75			
3.25 to 3.75			
2.75 to 3.25			
2.25 to 2.75			
1.75 to 2.25			
1.25 to 1.75			
0.75 to 1.25			
0.25 to 0.75			
-0.75 to -0.25			
-1.25 to -0.75			
-1.75 to -1.25			
-2.25 to -1.75			
Below -2.25			
Total			
Time (Min)			

MMWA 11DA

Altitude - 0 to 1,000 Feet W - 12,000 lb

Equivalent Airspeed - VE (Knots)		Total	
Load Factor	Delta n <sub>z</sub>	225 and Above	Delta n <sub>z</sub>
Above 3.75			
3.25 to 3.75			
2.75 to 3.25			
2.25 to 2.75			
1.75 to 2.25			
1.25 to 1.75			
0.75 to 1.25			
0.25 to 0.75			
-0.75 to -0.25			
-1.25 to -0.75			
-1.75 to -1.25			
-2.25 to -1.75			
Below -2.25			
Total			
Time (Min)			

-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total

Time (Min)	0.5	9.7	21.8	49.9	649	1,953	533	22	3,209
					403.7	767.0	112.2	3.5	1,368.3

MMWA 11DB

Altitude - 1,000 to 2,000 Feet W - 12,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25				83	308	921	77	2	2
0.25 to 0.75			3	51	282	892	100		1,391
-0.75 to -0.25									1,328
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total			3	134	590	1,815	177	2	2,721

Time (Min)

	2.1	21.7	176.8	437.3	732.2	79.5	1.7	1,451.4
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MMWA 11DC

Altitude - 2,000 to 5,000 Feet W - 12,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75			1	3	9	37	4	1	55
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total				1	13	40	2	1	57



## MMWA 11DC

Total	3	134	590	1,815	177	2	2,721
Time (Min)	2.1	21.7	176.8	437.3	732.2	79.5	1,451.4
Altitude - 2,000 to 5,000 Feet W - 12,000 lb							
Equivalent Airspeed - VE (Knots)							
Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75	1	3	9	37	4	1	55
-0.75 to -0.25							
-1.25 to -0.75		1	13	40	2	1	57
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25	1	4	22	77	6	2	112
Total							
Time (Min)	3.0	35.0	84.4	136.4	9.0	5.4	273.2

## MMWA 11DD

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 3.75						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.75 to 1.25						
0.25 to 0.75			1	1		2
-0.75 to -0.25				1		1
-1.25 to -0.75						
-1.75 to -1.25						
-2.25 to -1.75						
Below -2.25						
Total			1	2		3

Altitude - 0 to 1,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75			5	61	716	1,530	119	1	2,432
						6			6
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total			8	96	1,354	2,925	216	3	4,602
Time (Min)	0.4	7.7	21.4	111.8	769.4	930.4	93.5	6.7	1,941.2

Altitude - 1,000 to 2,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									5 1,456
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									5 1,346
0.75 to 1.25									
0.25 to 0.75		3	71	408	889	85			
-0.75 to -0.25									2 1,439.9
-1.25 to -0.75		3	39	335	901	68			
-1.75 to -1.25					2				
-2.25 to -1.75									
Below -2.25									
Total		6	110	743	1,797	153			2,809
Time (Min)		15.6	183.9	498.0	671.6	67.7	3.1		1,439.9

-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total  
Time (Min)

MMWA 11EC

Altitude - 2,000 to 5,000 Feet W - 13,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75			7	35	48	1		91
-0.75 to -0.25								
-1.25 to -0.75			2	35	48	4		89
-1.75 to -1.25								
-2.25 to -1.75								
Below -2.25								
Total			9	70	96	5		180
Time (Min)		1.1	42.2	105.3	81.4	11.6	1.3	243.0

MMWA 11FA

Altitude - 0 to 1,000 Feet W - 14,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									674
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									563
0.75 to 1.25			4	6	135	450	79		
0.25 to 0.75									
-0.75 to -0.25									1
1.25 to -0.75			1	10	123	389	39		
-0.75 to -1.25									

MMWA	11FB	Altitude - 1,000 to 2,000 Feet W - 14,000 lb									
		Equivalent Airspeed - VE (Knots)									
		Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
		Time (Min)	0.2	3.9	7.7	19.2	153.5	279.9	36.8	1.7	503.0
		Total									
		1,237									
		1.7									
		36.8									
279.9											
153.5											
118											
839											
258											
16											
19.2											
7.7											
3.9											
0.2											
Time (Min)											
Below -2.25											
-2.25 to -1.75											
-1.75 to -1.25											
-1.25 to -0.75											
-0.75 to -0.25											
0.25 to 0.75											
Total											
288											
193											
62											
16											
4.6											
0.2											
Time (Min)											
Below -2.25											
-2.25 to -1.75											
-1.75 to -1.25											
-1.25 to -0.75											
-0.75 to -0.25											
0.25 to 0.75											
Total											
146											
104											
32											
9											
15											
89											
30											
7											
1											
142											
225											
200											
175											
150											
125											
100											
75											
Less Than 75											
Equivalent Airspeed - VE (Knots)											
Altitude - 2,000 to 5,000 Feet W - 14,000 lb											
MMWA	11FC	Equivalent Airspeed - VE (Knots)									
		Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
		Time (Min)	0.2	3.9	7.7	19.2	153.5	279.9	36.8	1.7	503.0
		Total									
		1,237									
		1.7									
		36.8									
		279.9									
153.5											
118											
839											
258											
16											
19.2											
7.7											
3.9											
0.2											
Time (Min)											
Below -2.25											
-2.25 to -1.75											
-1.75 to -1.25											
-1.25 to -0.75											
-0.75 to -0.25											
0.25 to 0.75											
Total											
288											
193											
62											
16											
4.6											
0.2											
Time (Min)											
Below -2.25											
-2.25 to -1.75											
-1.75 to -1.25											
-1.25 to -0.75											
-0.75 to -0.25											
0.25 to 0.75											
Total											
146											
104											
32											
9											
15											
89											
30											
7											
1											
142											
225											
200											
175											
150											
125											
100											
75											
Less Than 75											
Equivalent Airspeed - VE (Knots)											
Altitude - 2,000 to 5,000 Feet W - 14,000 lb											

Time (Min)	Altitude - 2,000 to 5,000 Feet W - 14,000 lb							0.1	303.8
	Equivalent Airspeed - VE (Knots)								
Load Factor Delta n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75					2	2	1		5
0.75 to -0.25									
1.25 to -0.75						4			4
1.75 to -1.25									
2.25 to -1.75									
Below -2.25									
Total					2	6	1		9
Time (Min)		1.0	17.4	35.7	22.9	0.9			77.9

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots) All Weights								Total Delta n <sub>z</sub>	
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above		
Above 3.75									15 8,311 7,608 5	
3.25 to 3.75										
2.75 to 3.25										
2.25 to 2.75										
1.75 to 2.25										
1.25 to 1.75									15 8,311 7,608 5	
1.25 to 1.75										
0.75 to 1.25										
0.25 to 0.75										
0.75 to -0.25										
1.25 to -0.75									15 8,311 7,608 5	
1.75 to -1.25										
2.25 to -1.75										
Below -2.25										
Total										
Time (Min)	1.4	32.8	117.1	704.9	446	3,961	10,207	1,260	30	15,939

MMWA 12CA

Altitude - 0 to 1,000 Feet W - 11,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total  Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75		1				1		2
-0.75 to -0.25							2	2
-1.25 to -0.75								
-1.75 to -1.25								
-2.25 to -1.75								
Below -2.25								
Total		1				1	2	4
Time (Min)		0.2	2.6	0.9	0.1	0.1	0.3	4.2

MMWA 12CB

Altitude - 1,000 to 2,000 Feet W - 11,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total  Delta n <sub>z</sub>	
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200		200 to 225
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75								
-0.75 to -0.25					1			1
-1.25 to -0.75								
-1.75 to -1.25								
-2.25 to -1.75								
Below -2.25								
Total					1			1
Time (Min)				0.1	9.2	3.8		13.1

-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total

1  
0.1 9.2 3.8  
13.1

Time (Min)

MMWA 12CC

Altitude - 2,000 to 5,000 Feet W - 11,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 3.75						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.75 to 1.25						
0.25 to 0.75						

2 2

-0.75 to -0.25  
-1.25 to -0.75  
-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total

2 2  
7.5 4.4 17.2 6.1  
35.2

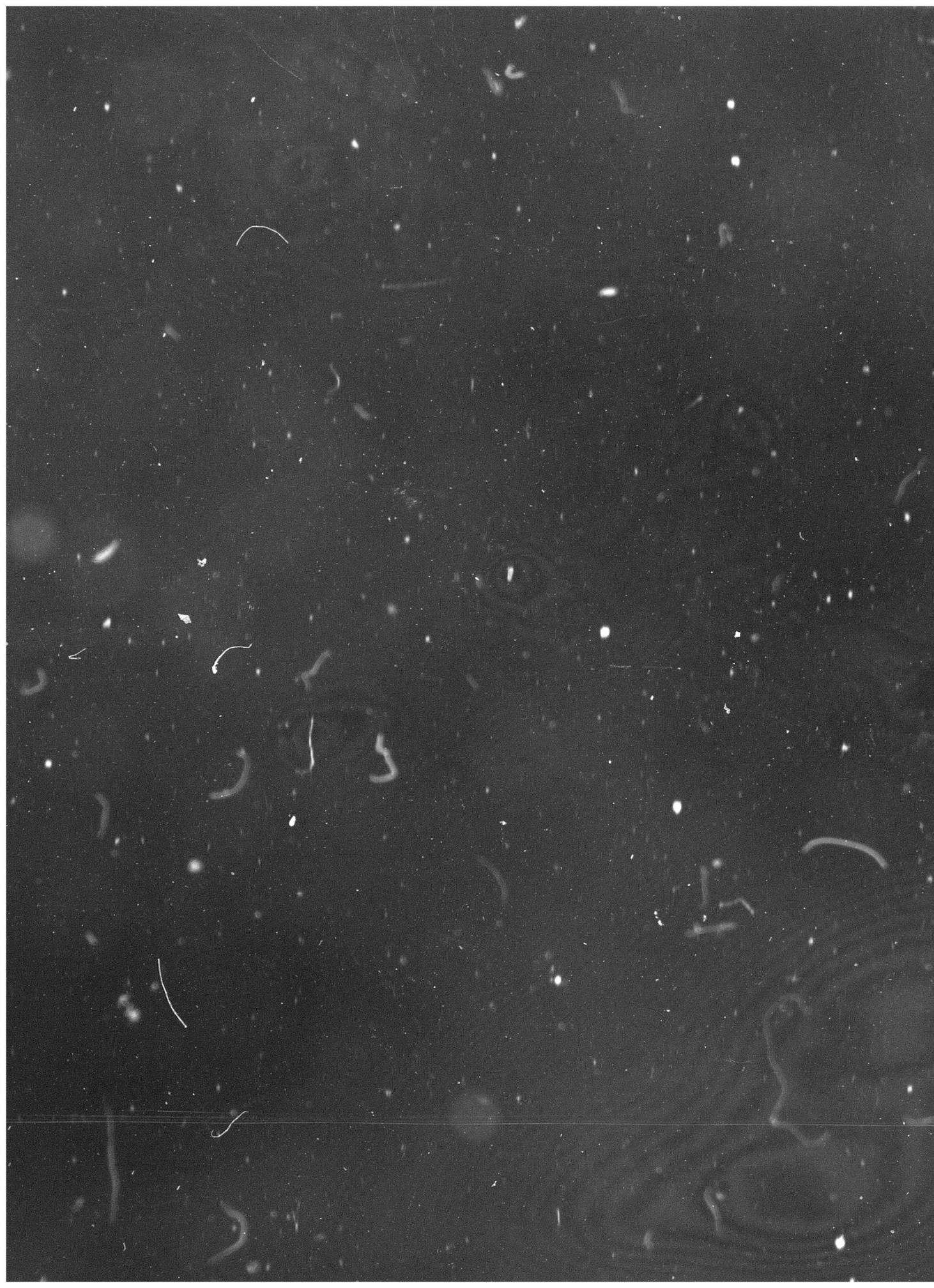
Time (Min)

MMWA 12DA

Altitude - 0 to 1,000 Feet W - 12,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 3.75						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.75 to 1.25						
0.25 to 0.75						

1 3 22 33 14 73  
2 11 23 8 44  
-0.75 to -0.25  
-1.25 to -0.75  
-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total





Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total Delta n <sub>z</sub>	
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200		200 to 225
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75		1	3	22	33	14	73	
-0.75 to -0.25			2	11	23	8	44	
-1.25 to -0.75								
-1.75 to -1.25								
-2.25 to -1.75								
Below -2.25								
Total		1	5	33	56	22	117	
Time (Min)	0.1	6.6	11.6	5.6	29.0	9.3	1.9	64.2

MMWA 12DB

Altitude - 1,000 to 2,000 Feet W - 12,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75		3	24	136	159	58		380
-0.75 to -0.25								
-1.25 to -0.75		4	20	134	159	44		361
-1.75 to -1.25					1			1
-2.25 to -1.75								
Below -2.25								
Total		7	44	270	319	102		742
Time (Min)	2.3	67.3	65.0	134.1	87.4	17.3	0.4	373.9

Altitude - 2,000 to 5,000 Feet W - 12,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total  Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25				23	73	73	24	3	196
0.25 to 0.75				21	56	53	14	2	146
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total				44	129	126	38	5	342
Time (Min)		2.5	49.1	100.8	198.8	142.6	66.0	1.6	561.5

Altitude - 0 to 1,000 Feet W - 13,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above
Above 3.75								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.75 to 1.25								
0.25 to 0.75			4	24	20	3	3	4
-0.75 to -0.25								58
-1.25 to -0.75								
-1.75 to -1.25			1	14	22	6	3	46
-2.25 to -1.75								
Below -2.25								
Total			5	38	42	9	6	4
104								
Time (Min)	0.5	11.5	27.4	26.4	71.8	90.2	6.8	0.7
235.3								

-0.75 to -0.25	1	14	22	6	3	46
-1.25 to -0.75						
-1.75 to -1.25						
-2.25 to -1.75						
Below -2.25						
Total	5	38	42	9	6	104

Time (Min)	0.5	11.5	27.4	26.4	71.8	90.2	6.8	0.7	235.3
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MMWA 12EB

Altitude - 1,000 to 2,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)									
Load Factor	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75									
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Below -2.25									
Total									
Time (Min)	0.4	39.4	78.9	215	235	56	24.2	2.7	529.3

MMWA 12EC

Altitude - 2,000 to 5,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)									
Load Factor	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total Delta n <sub>z</sub>
Above 3.75									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.75 to 1.25									
0.25 to 0.75									
-0.75 to -0.25									
-1.25 to -0.75									
-1.75 to -1.25									
-2.25 to -1.75									
Total									
Time (Min)	0.4	39.4	78.9	215	235	56	24.2	2.7	529.3

-2.25 to -1.75  
Below -2.25

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75							
-0.75 to -0.25							
-1.25 to -0.75							
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total							
Time (Min)							

MMWA 12ED

Altitude - 5,000 to 10,000 Feet W - 13,000 lb

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75							
-0.75 to -0.25							
-1.25 to -0.75							
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total							
Time (Min)							

TABLE VIII contd.

MMWA 12FA

Altitude - 0 to 1,000 Feet W - 14,000 lb

Load Factor Delta $n_z$	Equivalent Airspeed - VE (Knots)						Total Delta $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225 and Above
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75							
-0.75 to -0.25					4	2	6
-1.25 to -0.75					3	6	10
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total					7	8	16
Time (Min)	5.0	10.3	16.0	16.2	23.8	4.1	75.3

MMWA 12FB

Altitude - 1,000 to 2,000 Feet W - 14,000 lb

Load Factor Delta $n_z$	Equivalent Airspeed - VE (Knots)						Total Delta $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225 and Above
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75							
-0.75 to -0.25					1	17	1
-1.25 to -0.75					40		58
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total					8	16	89
Time (Min)	0.5	4.6	41.7	79.7	36.2	1.1	163.8

-0.15 to -0.25  
-1.25 to -0.75  
-1.75 to -1.25  
-2.25 to -1.75  
Below -2.25  
Total

Time (Min)

MMWA 12FC

**Altitude - 2,000 to 5,000 Feet W - 14,000 lb**

[illegible]

Equivalent Airspeed - VE (Knots)

Load Factor	Delta n <sub>z</sub>
0.0	0.000
0.1	0.000
0.2	0.000
0.3	0.000
0.4	0.000
0.5	0.000
0.6	0.000
0.7	0.000
0.8	0.000
0.9	0.000
1.0	0.000

Above	3.75
3.25 to	3.75
2.75 to	3.25
2.25 to	2.75
1.75 to	2.25
1.25 to	1.75
0.75 to	1.25
0.25 to	0.75

57

3

21

33

3

**-0.75 to -0.25**  
**-1.25 to -0.75**  
**-1.75 to -1.25**  
**-2.25 to -1.75**  
**Below -2.25**  
**Total**

**Total**

5

55

96

5

Time (Min)

25.7	46.1	258.2	133.6	8.8
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472.4

MMWA 12FD

Altitude - 5,000 to 10,000 Feet W - 14,000 lb

Total	Delta n <sub>Z</sub>
0.98	-0.06
0.97	-0.06
0.96	-0.06
0.95	-0.06
0.94	-0.06
0.93	-0.06
0.92	-0.06
0.91	-0.06
0.90	-0.06
0.89	-0.06
0.88	-0.06
0.87	-0.06
0.86	-0.06
0.85	-0.06
0.84	-0.06
0.83	-0.06
0.82	-0.06
0.81	-0.06
0.80	-0.06
0.79	-0.06
0.78	-0.06
0.77	-0.06
0.76	-0.06
0.75	-0.06
0.74	-0.06
0.73	-0.06
0.72	-0.06
0.71	-0.06
0.70	-0.06
0.69	-0.06
0.68	-0.06
0.67	-0.06
0.66	-0.06
0.65	-0.06
0.64	-0.06
0.63	-0.06
0.62	-0.06
0.61	-0.06
0.60	-0.06
0.59	-0.06
0.58	-0.06
0.57	-0.06
0.56	-0.06
0.55	-0.06
0.54	-0.06
0.53	-0.06
0.52	-0.06
0.51	-0.06
0.50	-0.06
0.49	-0.06
0.48	-0.06
0.47	-0.06
0.46	-0.06
0.45	-0.06
0.44	-0.06
0.43	-0.06
0.42	-0.06
0.41	-0.06
0.40	-0.06
0.39	-0.06
0.38	-0.06
0.37	-0.06
0.36	-0.06
0.35	-0.06
0.34	-0.06
0.33	-0.06
0.32	-0.06
0.31	-0.06
0.30	-0.06
0.29	-0.06
0.28	-0.06
0.27	-0.06
0.26	-0.06
0.25	-0.06
0.24	-0.06
0.23	-0.06
0.22	-0.06
0.21	-0.06
0.20	-0.06
0.19	-0.06
0.18	-0.06
0.17	-0.06
0.16	-0.06
0.15	-0.06
0.14	-0.06
0.13	-0.06
0.12	-0.06
0.11	-0.06
0.10	-0.06
0.09	-0.06
0.08	-0.06
0.07	-0.06
0.06	-0.06
0.05	-0.06
0.04	-0.06
0.03	-0.06
0.02	-0.06
0.01	-0.06
0.00	-0.06

Equivalent Airspeed - VE (Knots)

Load  
Factor  
Delta n<sub>2</sub>

Above	3.75
3.25 to	3.75
2.75 to	3.25
2.25 to	2.75
1.75 to	2.25
1.25 to	1.75
0.75 to	1.25
0.25 to	0.75

15

6

५

**-0.75 to -0.25**  
**-1.25 to -0.75**  
**-1.75 to -1.25**  
**-2.25 to -1.75**

to -0.

10

1

-2.25 to -1.75  
Below -2.25

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200 200 225 and Above	
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75				4	9	2	15
-0.75 to -0.25				1	10	1	12
-1.25 to -0.75							
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total				5	19	3	27
Time (Min)			2.8	11.6	13.8	0.5	28.7

MM

12

Load Factor Delta n <sub>z</sub>	Equivalent Airspeed - VE (Knots) All Weights						Total Delta n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200 200 225 and Above	
Above 3.75							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.75 to 1.25							
0.25 to 0.75							
-0.75 to -0.25							
-1.25 to -0.75							
-1.75 to -1.25							
-2.25 to -1.75							
Below -2.25							
Total				12	1	14	1,340
Time (Min)	0.6	29.1	275.5	548.0	1,585.5	1,360.1	4,047.7

TABLE IX  
DELTA  $n_z$  VERSUS AIRSPEED

COMP	Load Factor Delta $n_z$	Equivalent Airspeed - VE (Knots)							Total Delta $n_z$
		Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	
	Above 3.75								
	3.25 to 3.75								
	2.75 to 3.25								
	2.25 to 2.75								
	1.75 to 2.25								
	1.25 to 1.75								
	0.75 to 1.25					1	15		16
	0.25 to 0.75			30	386	2,561	5,799	846	9,651
	-0.75 to -0.25		1	25	264	2,380	5,470	704	8,861
	-1.25 to -0.75						5	1	6
	-1.75 to -1.25								
	-2.25 to -1.75								
	Below -2.25								
	Total		1	55	650	4,942	11,289	1,551	18,534
	Time (Min)	2.0	61.9	392.7	1,252.9	4,309.9	5,499.0	686.2	12,234.4



TABLE X  
MANEUVER  $n_z$  VERSUS AIRSPEED FOR MISSION I BY WEIGHT BY ALTITUDE

	Altitude - 0 to 1,000 Feet W - 11,000 lb						Total
	Equivalent Airspeed - VE (Knots)						
Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225 and Above
Above 4.75							
4.25 to 4.75						1	1
3.75 to 4.25						1	1
3.25 to 3.75						3	7
2.75 to 3.25						7	14
2.25 to 2.75					1		
1.75 to 2.25					6		
1.25 to 1.75		6	28	18	45	120	221
0.25 to 0.75		2		3	12	77	94
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total		8	28	21	64	209	338
Time (Min)	0.3	8.0	10.1	5.0	14.9	63.1	102.8

MMWA	11CB	Altitude - 1,000 to 2,000 Feet W - 11,000 lb									
		Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total n <sub>z</sub>
			Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
		Above 4.75									
		4.25 to 4.75									
		3.75 to 4.25									
		3.25 to 3.75									
		2.75 to 3.25									
		2.25 to 2.75				1	1			2	3
		1.75 to 2.25				6	5			3	2
		1.25 to 1.75			17	64	108			10	5
											20
											317
		0.25 to 0.75		1	10		40			6	
		-0.25 to 0.25									
		-0.75 to -0.25									
		-1.25 to -0.75									
		Below -1.25									
		Total		18	81		154			22	457
		Time (Min)	1.2	7.9	29.4		64.6			5.5	190.6

Time (Min)

190.6

5.5

82.0

64.6

29.4

7.9

1.2

MMWA 11CC

Altitude - 2,000 to 5,000 Feet W - 11,000 lb

Equivalent Airspeed - VE (Knots)

Load  
Factor  
n<sub>z</sub>Less  
Than  
7575  
to  
100100  
to  
125125  
to  
150150  
to  
175175  
to  
200200  
to  
225225  
and  
Above

Total

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25  
Total

Time (Min)

41

25.7

MMWA 11DA

Altitude - 0 to 1,000 Feet W - 12,000 lb

Equivalent Airspeed - VE (Knots)

Load  
Factor  
n<sub>z</sub>Less  
Than  
7575  
to  
100100  
to  
125125  
to  
150150  
to  
175175  
to  
200200  
to  
225225  
and  
Above

Total

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25  
Total

Time (Min)

7,245

1,358.3

TABLE X contd.

MMWA 11DB

Altitude - 1,000 to 2,000 Feet W - 12,000 lb

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25				2	2	5
2.25 to 2.75			8	19	16	46
1.75 to 2.25			27	129	145	328
1.25 to 1.75	3	44	405	1,262	1,732	3,667
0.25 to 0.75	1	8	77	271	464	850
-0.25 to 0.25					1	1
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total	4	52	517	1,683	2,360	4,897
Time (Min)	2.1	21.7	176.8	437.3	732.2	1,451.4

MMWA 11DC

Altitude - 2,000 to 5,000 Feet W - 12,000 lb

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25				1	1	4
2.25 to 2.75			1	1	5	7
1.75 to 2.25		6	46	59	134	258
1.25 to 1.75						
0.25 to 0.75		1	12	19	17	50
-0.25 to 0.25						
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total		7	60	80	158	319
Time (Min)		3.0	35.0	84.4	136.4	273.2

MMWA 11DD

Altitude - 5,000 to 10,000 Feet W - 12,000 lb

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)					Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.25 to 0.75						
-0.25 to 0.25						
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total						
Time (Min)						

Time (Min)

### 1.941.2

TABLE X contd.

MMWA 11EB

Altitude - 1,000 to 2,000 Feet W - 13,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)						Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							1
4.25 to 4.75						2	2
3.75 to 4.25						1	5
3.25 to 3.75			1			2	8
2.75 to 3.25			1			2	53
2.25 to 2.75			8		18	19	472
1.75 to 2.25		5	55		200	19	4,012
1.25 to 1.75		14	304		1,589	108	
0.25 to 0.75		2	94		300	418	858
-0.25 to 0.25			1			2	3
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total		21	464		2,107	2,628	5,414
Time (Min)		15.6	183.9		498.0	671.6	1,439.9

MMWA 11EC

Altitude - 2,000 to 5,000 Feet W - 13,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)						Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							1
4.25 to 4.75							1
3.75 to 4.25							6
3.25 to 3.75				1			36
2.75 to 3.25			3				267
2.25 to 2.75			18				
1.75 to 2.25		1	54				
1.25 to 1.75		6					
0.25 to 0.75			15		21	25	62
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total		7	91		145	122	373
Time (Min)		1.1	42.2		105.3	81.4	243.0

MMWA 11ED

Altitude - 5,000 to 10,000 Feet W - 13,000 lb

Time (Min)

1.1 42.2 105.3 81.4 11.6 1.3 243.0

MMWA 11ED

Altitude - 5,000 to 10,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load

Factor  
n<sub>z</sub>Less  
Than  
7575 to  
100100 to  
125125 to  
150150 to  
175175 to  
200200 to  
225225 and  
Above

Total

n<sub>z</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

8

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

7

Total

15

Time (Min)

118.0

83.1

31.1

2.5

1.2

1

1

1

1

1

MMWA 11FA

Altitude - 0 to 1,000 Feet W - 14,000 lb

Equivalent Airspeed - VE (Knots)

Load

Factor  
n<sub>z</sub>Less  
Than  
7575 to  
100100 to  
125125 to  
150150 to  
175175 to  
200200 to  
225225 and  
Above

Total

n<sub>z</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

6

9

23

103

1,311

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

376

1

Total

1,826

Time (Min)

503.0

279.9

153.5

19.2

7.7

3.9

0.2

0.2

0.2

0.2

TABLE X contd.

MMWA 11FB

Altitude - 1,000 to 2,000 Feet W - 14,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)					Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.25 to 0.75						
-0.25 to 0.25						
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total						
Time (Min)						

MMWA 11FC

Altitude - 2,000 to 5,000 Feet W - 14,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)					Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25						
2.25 to 2.75						
1.75 to 2.25						
1.25 to 1.75						
0.25 to 0.75						
-0.25 to 0.25						
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total						
Time (Min)						

----- Total 2 16 27 13 58

Time (Min) 1.0 17.4 35.7 22.9 0.9 77.9

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							
4.25 to 4.75							
3.75 to 4.25							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.25 to 0.75							
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total			1		2		3

Time (Min)

4.9 18.9 23.8

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)						Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							
4.25 to 4.75							
3.75 to 4.25							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.25 to 0.75							
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total							
1.4	32.8	117.1	704.9	2,724.4	4,138.9	443.0	8,186.7



TABLE XI

	<b>Altitude -        0 to 1,000 Feet W - 11,000 lb</b>						
	<b>Equivalent Airspeed - VE (Knots)</b>						
<b>Load Factor n<sub>Z</sub></b>	<b>Less Than 75</b>	<b>75 to 100</b>	<b>100 to 125</b>	<b>125 to 150</b>	<b>150 to 175</b>	<b>175 to 200</b>	Total  n <sub>Z</sub>
Above 4.75							
4.25 to 4.75							
3.75 to 4.25							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75		2	4		1	4	11
0.25 to 0.75							
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total		2	4		1	4	11
Time (Min)	0.2	2.6	0.9	0.1	0.1	0.3	4.2

MMWA	12CB	Altitude - 1,000 to 2,000 Feet W - 11,000 lb								Total n <sub>z</sub>	
		Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225		225 and Above
		Above 4.75									6
		4.25 to 4.75									
		3.75 to 4.25									
		3.25 to 3.75									
		2.75 to 3.25									
		2.25 to 2.75									
		1.75 to 2.25									
		1.25 to 1.75			1		4		1		
		0.25 to 0.75									
		-0.25 to 0.25									
		-0.75 to -0.25									
		-1.25 to -0.75									
		Below -1.25									
		Total			1		4		1		6
		Time (Min)			0.1		9.2		3.8		13.1

Altitude - 2.000 to 5.000 Feet W - 11.000 lb

MMWA 12CC

Altitude - 2,000 to 5,000 Feet W - 11,000 lb

Below -1.25	1	4	1	6
Total				
Time (Min)	0.1	9.2	3.8	13.1

MMWA 12CC

Altitude - 2,000 to 5,000 Feet W - 11,000 lb

Equivalent Airspeed - VE (Knots)					Total n <sub>z</sub>
Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	
Above 4.75					
4.25 to 4.75					
3.75 to 4.25					
3.25 to 3.75					
2.75 to 3.25					
2.25 to 2.75					
1.75 to 2.25					
1.25 to 1.75					
0.25 to 0.75					
-0.25 to 0.25					
-0.75 to -0.25					
-1.25 to -0.75					
Below -1.25					
Total					
Time (Min)	7.5	4.4	17.2	6.1	35.2

MMWA 12DA

Altitude - 0 to 1,000 Feet W - 12,000 lb

Equivalent Airspeed - VE (Knots)					Total n <sub>z</sub>
Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	
Above 4.75					
4.25 to 4.75					
3.75 to 4.25					
3.25 to 3.75					
2.75 to 3.25					
2.25 to 2.75					
1.75 to 2.25					
1.25 to 1.75					
0.25 to 0.75					
-0.25 to 0.25					
-0.75 to -0.25					
-1.25 to -0.75					
Below -1.25					
Total					
Time (Min)	3	13	25	209	254

2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75  
  
0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

Total

Time (Min) 0.1 6.6 11.6 5.6 29.0 9.3 1.9 64.2

MMWA 12DB

Altitude - 1,000 to 2,000 Feet W - 12,000 lb

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225 and Above	

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75  
  
0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

Total

Time (Min) 2.3 67.3 65.0 134.1 87.4 17.3 0.4 373.9

MMWA 12DC

Altitude - 2,000 to 5,000 Feet W - 12,000 lb

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)							Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225 and Above	

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

1 2 9 71 70 20 2 14 235

235 2 20 70 71 72

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Equivalent Airspeed - VE (Knots)								Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 4.75									21 398
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									126
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.25 to 0.75									545
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									373.9
Total									
Time (Min)	2.3	67.3	65.0	134.1	87.4	17.3	0.4		

MMWA 12DC

Altitude - 2,000 to 5,000 Feet W - 12,000 lb



Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Equivalent Airspeed - V <sub>E</sub> (Knots)								Total n <sub>z</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	
Above 4.75									14 235
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									64
2.25 to 2.75									
1.75 to 2.25				1 72	2 71	9 70	2 20	2	
1.25 to 1.75									
0.25 to 0.75				23	22	13	5	1	313 561.5
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									313
Total				96	95	92	27	3	
Time (Min)		2.5	49.1	100.8	198.8	142.6	66.0	1.6	561.5

TABLE XI contd.

MMWA 12DD

Altitude - 5,000 to 10,000 Feet W - 12,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)						Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							
4.25 to 4.75							
3.75 to 4.25							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.25 to 0.75				1		2	3
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total				1	36.7	44.8	94.5
Time (Min)				10.0	3.0		

MMWA 12EA

Altitude - 0 to 1,000 Feet W - 13,000 lb

Load Factor $n_z$	Equivalent Airspeed - VE (Knots)						Total $n_z$
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	
Above 4.75							
4.25 to 4.75							
3.75 to 4.25							
3.25 to 3.75							
2.75 to 3.25							
2.25 to 2.75							
1.75 to 2.25							
1.25 to 1.75							
0.25 to 0.75							
-0.25 to 0.25							
-0.75 to -0.25							
-1.25 to -0.75							
Below -1.25							
Total	1	8	24	41	156	105	349
Time (Min)	0.5	11.5	27.4	26.4	71.8	90.2	235.3

MMWA 12EB

Altitude - 1,000 to 2,000 Feet W - 13,000 lb

Time (Min)	0.5	11.5	27.4	26.4	71.8	90.2	6.8	0.7	235.3
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MMWA 12EB

Altitude - 1,000 to 2,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	Equivalent Airspeed - VE (Knots)				225 and Above	Total n <sub>z</sub>
				125 to 150	150 to 175	175 to 200	200 to 225		
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.25 to 0.75			5	62	13	16	8	5	42
-0.25 to 0.25					317	228	53	11	676
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25			1	14	104	58	10	1	188
Total			6	76	434	302	71	17	906
Time (Min)	0.4	39.4	78.9	189.2	194.5	24.2	2.7		529.3

MMWA 12EC

Altitude - 2,000 to 5,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	Equivalent Airspeed - VE (Knots)				225 and Above	Total n <sub>z</sub>
				125 to 150	150 to 175	175 to 200	200 to 225		
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75			1	24	87	76	17	1	206
0.25 to 0.75									
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25			1	10	34	27	3		75
Total			2	34	121	104	20	1	282
Time (Min)		29.9	103.4	382.9	313.7	94.4	0.2		924.5

Total 2 34 121 104 20 1 282

Time (Min)

29.9 103.4 382.9 313.7 94.4 0.2 924.5

MMWA 12ED

Altitude - 5,000 to 10,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor $n_z$	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total $n_z$
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.25 to 0.75									
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total									
Time (Min)									

MMWA 12EE

Altitude - 10,000 to 15,000 Feet W - 13,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor $n_z$	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total $n_z$
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75									
0.25 to 0.75									
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total									
Time (Min)									

63.8

TABLE XI contd.

MMWA 12FA

Altitude - 0 to 1,000 Feet W - 14,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor $n_z$	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total $n_z$
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25				1	29	26	1		1
1.25 to 1.75				15	29	26	1		76
0.25 to 0.75		2	3						
-0.25 to 0.25		1	3	4	7	9			24
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total		3	6	19	37	35	1		101
Time (Min)		5.0	10.3	16.0	16.2	23.8	4.1		75.3

MMWA 12FB

Altitude - 1,000 to 2,000 Feet W - 14,000 lb

Equivalent Airspeed - VE (Knots)

Load Factor $n_z$	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total $n_z$
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25					1	1	1		3
1.25 to 1.75				23	119	34	3		180
0.25 to 0.75									
-0.25 to 0.25				8	93	14			115
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total		1		31	213	49	4		298
Time (Min)		0.5	4.6	41.7	79.7	36.2	1.1		163.9



Below -1.25

Total

1 31 213 49 4 298

0.5 4.6 41.7 79.7 36.2 1.1 163.8

MMWA 12FC

Altitude - 2,000 to 5,000 Feet W - 14,000 lb

Equivalent Airspeed - VE (Knots)

Total

Less Than 75 75 to 100 100 to 125 125 to 150 150 to 175 175 to 200 200 to 225 225 and Above

n<sub>z</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

2 2 4  
12 143 38 193

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

12 91 38 141

Total

24 236 78 338

Time (Min)

25.7 46.1 258.2 133.6 8.8 472.4

MMWA 12FD

Altitude - 5,000 to 10,000 Feet W - 14,000 lb

Equivalent Airspeed - VE (Knots)

Total

Less Than 75 75 to 100 100 to 125 125 to 150 150 to 175 175 to 200 200 to 225 225 and Above

n<sub>z</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

5 5 1 11

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25

5 6 11

Total

10 11 1 22

Time (Min)

2.8 11.6 13.8 0.5 28.7

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total n <sub>z</sub>
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75				5	5	1			11
0.25 to 0.75									
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total				10	11	1			22
Time (Min)				2.8	11.6	13.8	0.5		28.7

MM 12

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>z</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total n <sub>z</sub>
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75				1	3				4
0.25 to 0.75				2	32	50	17	6	107
-0.25 to 0.25				322	1,282	748	148	23	2,595
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total	1	12	59	102	441	250	28	2	854
Time (Min)	0.6	29.1	275.5	548.0	1,585.5	1,360.1	243.2	5.6	4,047.7

TABLE XII  
MANEUVER  $n_z$  VERSUS AIRSPEED

COMP	Load Factor $n_z$	Equivalent Airspeed - VE (Knots)							Total $n_z$
		Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	
	Above 4.75						1	2	4
	4.25 to 4.75						2	16	21
	3.75 to 4.25				2	1	22	62	112
	3.25 to 3.75				1	6	50	37	106
	2.75 to 3.25				23	97	223	83	447
	2.25 to 2.75				161	813	1,306	240	2,545
	1.75 to 2.25	1	48	271	1,681	9,795	12,530	1,386	25,798
	1.25 to 1.75								
	0.25 to 0.75		18	73	432	2,067	2,920	273	5,805
	-0.25 to 0.25			1	2		8	2	13
	-0.75 to -0.25								
	-1.25 to -0.75								
	Below -1.25								
	Total	1	66	351	2,302	12,779	17,062	2,101	34,851
	Time (Min)	2.0	61.9	392.7	1,252.9	4,309.9	5,499.0	686.2	12,234.4

TABLE XIII  
EQUIVALENT MANEUVER  $n_{ze}$  VERSUS AIRSPEED FOR MISSION I BY ALTITUDE

MMWA 110A	Altitude - 0 to 1,000 Feet	Equivalent Airspeed - VE (Knots)
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## Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Equivalent Airspeed - VE (Knots)														Total n <sub>ze</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	225 to 250	250 to 275	275 to 300	300 to 325	325 to 350	350 to 375	
Above 4.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	1
4.25 to 4.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	19
3.75 to 4.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	88
3.25 to 3.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	68
2.75 to 3.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	153
2.25 to 2.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	625
1.75 to 2.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	3,575
1.25 to 1.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	16,430
0.25 to 0.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	1,164
-0.25 to 0.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	4
-0.75 to -0.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	
-1.25 to -0.75	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	
Below -1.25	1	87	232	3	82	657	1,186	6,214	8,370	1,985	296	831	38	16,430	
Total	1	92	238	782	7,894	11,528	1,469	22,127	12.0	3,915.3					
Time (Min)	1.4	29.3	61.1	185.9	1,341.4	2,040.4	243.9	22,127	12.0	3,915.3					

MMWA 110B

## Altitude - 1,000 to 2,000 Feet

Load Factor n <sub>ze</sub>	Equivalent Airspeed - VE (Knots)											Total n <sub>ze</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above				
Above 4.75								1			1	
4.25 to 4.75						2	3	1			6	
3.75 to 4.25						1	2				3	
3.25 to 3.75				2	2	3	6	4			17	
2.75 to 3.25				4	13	14	5	1			37	
2.25 to 2.75		3	47	132	132	129	22	3			336	
1.75 to 2.25		8	190	744	744	912	76	6			1,936	
1.25 to 1.75	3	138	1,297	3,815	3,815	5,055	441	8			10,757	
0.25 to 0.75	1	6	81	278	278	490	41	4			901	
-0.25 to 0.25			1			1					2	
-0.75 to -0.25												
-1.25 to -0.75												
Below -1.25												
Total	4	155	1,622	4,984	4,984	6,607	596	28			13,996	
Time (Min)	3.5	49.7	412.7	1,096.0	1,096.0	1,644.4	174.3	4.9			3,385.7	
0.25 to 0.75	1	6	81	278	278	490	41	4			901	
-0.25 to 0.25			1			1					2	
-0.75 to -0.25												
-1.25 to -0.75												

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75901  
4  
901  
2

-1.25 to -0.75  
Below -1.25  
Total

Time (Min)

4	155	1,622	4,984	6,607	596	28	13,996
3.5	49.7	412.7	1,096.0	1,644.4	174.3	4.9	3,385.7

MMWA 110C

Altitude - 2,000 to 5,000 Feet

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Less Than 75	Equivalent Airspeed - VE (Knots)				200 to 225	225 and Above	Total n <sub>ze</sub>
		75 to 100	100 to 125	125 to 150	150 to 175			
Above 4.75								1
4.25 to 4.75				1				1
3.75 to 4.25								1
3.25 to 3.75				3				5
2.75 to 3.25				10	8			24
2.25 to 2.75			2	25	32	1		104
1.75 to 2.25			17	160	311	20	10	822
1.25 to 1.75								
0.25 to 0.75		1	17	24		1	1	69
-0.25 to 0.25								
-0.75 to -0.25								
-1.25 to -0.75								
Below -1.25								
Total		20	216	375		22	11	1,027
Time (Min)		5.1	97.2	234.8		21.5	6.8	619.8

MMWA 110D

Altitude - 5,000 to 10,000 Feet

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Less Than 75	Equivalent Airspeed - VE (Knots)				200 to 225	225 and Above	Total n <sub>ze</sub>
		75 to 100	100 to 125	125 to 150	150 to 175			
Above 4.75								
4.25 to 4.75								
3.75 to 4.25								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75		1	4	13		3		47
0.25 to 0.75								
-0.25 to 0.25								
-0.75 to -0.25								
-1.25 to -0.75								
Total								
Time (Min)								

MMWA 110D

Altitude - 5,000 to 10,000 Feet

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Equivalent Airspeed - VE (Knots)				175 to 200	200 to 225	225 and Above	Total n <sub>ze</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150				
Above 4.75								
4.25 to 4.75								
3.75 to 4.25								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75		1	4	13	26	3		47
0.25 to 0.75				2	9			11
-0.25 to 0.25								
-0.75 to -0.25								
-1.25 to -0.75								
Below -1.25								
Total		1	4	15	35	3		58
Time (Min)		1.2	9.1	52.3	199.7	3.3	0.5	266.0

Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Equivalent Airspeed - VE (Knots)				175 to 200	200 to 225	225 and Above	Total n <sub>ze</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150				
Above 4.75								
4.25 to 4.75								
3.75 to 4.25								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.25 to 0.75								
-0.25 to 0.25								
-0.75 to -0.25								
-1.25 to -0.75								
Below -1.25								
Total		1	4	13	26	3		47
Time (Min)		1.2	9.1	52.3	199.7	3.3	0.5	266.0

Load Factor n <sub>ze</sub>	Equivalent Airspeed - VE (Knots)				175 to 200	200 to 225	225 and Above	Total n <sub>ze</sub>
	Less Than 75	75 to 100	100 to 125	125 to 150				
Above 4.75								
4.25 to 4.75								
3.75 to 4.25								
3.25 to 3.75								
2.75 to 3.25								
2.25 to 2.75								
1.75 to 2.25								
1.25 to 1.75								
0.25 to 0.75								
-0.25 to 0.25								
-0.75 to -0.25								
-1.25 to -0.75								
Below -1.25								
Total		1	4	13	26	3		47
Time (Min)		1.2	9.1	52.3	199.7	3.3	0.5	266.0

TABLE XIV  
EQUIVALENT MANEUVER  $n_z$  VERSUS AIRSPEED FOR MISSION II BY ALTITUDE

	Altitude - 0 to 1,000 Feet					
	Equivalent Airspeed - VE (Knots)					
Load Factor n <sub>ze</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	Total n <sub>ze</sub>
Above 4.75						
4.25 to 4.75						
3.75 to 4.25						
3.25 to 3.75						
2.75 to 3.25					1	1
2.25 to 2.75				1	1	3
1.75 to 2.25				4	44	136
1.25 to 1.75	2	44	112	140	225	1,027
0.25 to 0.75		2	2	5	7	20
-0.25 to 0.25						
-0.75 to -0.25						
-1.25 to -0.75						
Below -1.25						
Total	2	46	114	150	277	1,187
Time (Min)	0.6	23.4	51.8	48.8	123.4	379.0

MMWA	120B	Altitude - 1,000 to 2,000 Feet								
		Equivalent Airspeed - VE (Knots)						Total n <sub>ze</sub>		
		Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200			
								200 to 225	225 and Above	
	Above 4.75									
	4.25 to 4.75									
	3.75 to 4.25									
	3.25 to 3.75									
	2.75 to 3.25									
	2.25 to 2.75					3	5	1	4	13
	1.75 to 2.25				5	80	84	37	6	212
	1.25 to 1.75	3	3	55	238	950	578	91	11	1,926
	0.25 to 0.75				9	75	41	5		130
	-0.25 to 0.25									
	-0.75 to -0.25									
	-1.25 to -0.75									
	Below -1.25									
	Total	3	3	55	252	1,108	708	134	21	2,281

J.23 0 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25  
Total

Time (Min)

MMWA 120C

Altitude - 2,000 to 5,000 Feet

Equivalent Airspeed - VE (Knots)

Load  
Factor  
n<sub>ze</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

Less  
Than  
75

75  
100

100  
125

125  
150

150  
175

175  
200

200  
225

225  
and  
Above

Total  
n<sub>ze</sub>

4  
84  
1,480

B

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25  
Total

Time (Min)

MMWA 120D

Altitude - 5,000 to 10,000 Feet

Equivalent Airspeed - VE (Knots)

Load  
Factor  
n<sub>ze</sub>

Above 4.75  
4.25 to 4.75  
3.75 to 4.25  
3.25 to 3.75  
2.75 to 3.25  
2.25 to 2.75  
1.75 to 2.25  
1.25 to 1.75

Less  
Than  
75

75  
100

100  
125

125  
150

150  
175

175  
200

200  
225

225  
and  
Above

Total  
n<sub>ze</sub>

2  
1  
86

0.25 to 0.75  
-0.25 to 0.25  
-0.75 to -0.25  
-1.25 to -0.75  
Below -1.25  
Total

92

10





## Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total n <sub>ze</sub>
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25									
2.25 to 2.75									
1.75 to 2.25									
1.25 to 1.75					1	1			2
0.25 to 0.75									
-0.25 to 0.25					1				1
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total					2	1			3
Time (Min)			3.3	76.8		11.9			91.9

## MM 12

## Equivalent Airspeed - VE (Knots)

Load Factor n <sub>ze</sub>	Less Than 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 and Above	Total n <sub>ze</sub>
Above 4.75									
4.25 to 4.75									
3.75 to 4.25									
3.25 to 3.75									
2.75 to 3.25					1				1
2.25 to 2.75				1	7	9	1	4	22
1.75 to 2.25				14	206	156	48	9	433
1.25 to 1.75	2	47	174	661	2,196	1,247	173	21	4,521
0.25 to 0.75		2	4	35	104	68	8		221
-0.25 to 0.25									
-0.75 to -0.25									
-1.25 to -0.75									
Below -1.25									
Total	2	49	178	711	2,514	1,480	230	34	5,198
Time (Min)	0.6	29.1	275.5	548.0	1,585.5	1,360.1	243.2	5.6	4,047.7

TABLE XV  
EQUIVALENT AIRSPEED -  $V_e$  (KNOTS)

COMP	Load Factor NZE	Less Than 75	75 To 100	100 To 125	125 To 150	150 To 175	175 To 200	200 To 225	225 and Above	Total NZE
	Above 4.75							1	1	2
	4.25 to 4.75						8	14	4	26
	3.75 to 4.25			1	1		13	55	22	92
	3.25 to 3.75			2	4		29	37	14	86
	2.75 to 3.25			8	24		101	53	10	196
	2.25 to 2.75		3	63	301		489	132	19	1,007
	1.75 to 2.25		13	311	2,168		3,097	421	36	6,048
	1.25 to 1.75	3	137	562	2,779	12,549	15,002	1,468	77	32,577
	0.25 to 0.75		6	14	169	735	1,290	139	13	2,366
	-0.25 to 0.25				2		4			6
	-0.75 to -0.25									
	-1.25 to -0.75									
	Below -1.25									
	Total	3	145	592	3,335	15,782	20,033	2,320	196	42,406
	Time (Min)	2.0	61.9	392.7	1,252.9	4,309.9	5,499.0	686.2	29.8	12,234.4

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1. ORIGINATING ACTIVITY (Corporate author)  U. S. Army Aviation Materiel Laboratories Fort Eustis, Virginia		2a. REPORT SECURITY CLASSIFICATION  Unclassified
		2b. GROUP
3. REPORT TITLE  OV-1A Mohawk Flight Loads Investigation Program		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  Engineering Laboratory Report		
5. AUTHOR(S) (Last name, first name, initial)  Chestnutt, David		
6. REPORT DATE  January 1966	7a. TOTAL NO. OF PAGES  70	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO.  b. PROJECT NO. 1P125901A14229 c. House Task 65-15 d.		9a. ORIGINATOR'S REPORT NUMBER(S)  USAAVLABS Technical Report 66-6
		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
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11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY  US Army Aviation Materiel Laboratories Fort Eustis, Virginia
13. ABSTRACT  A primary objective of this effort was to provide operational data for establishing future STOL aircraft design criteria.  To accomplish this end, two OV-1A aircraft were selected that were participating in air-assault maneuvers. Approximately 200 hours of flight data were recorded within approximately 10 weeks. The parameters recorded were: airspeed, altitude, outside air temperature, and acceleration at the aircraft center of gravity. In addition, supplementary data were collected on the type of mission and gross weight of the aircraft.  These data were presented as several frequency-of-occurrence forms, exceedance curves, and gust spectra.		

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Operational Data Structural Loads Data VGH Data						

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